News about

B.F.Goodrich Chemical *raw materials*

simplify processing and rubber addition

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

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A presentation of experimental results showing that radiation cured silicone rubbers have increased resistance to aging.

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Discussing the thermal diffusivity coefficients for butyl rubber and some of its compounds.

838 **Swelling Behavior of Rubbers Compounded with Reinforcing Pigments**—By B.B.S.T. Boonstra and E. M. Dannenberg

Equilibrium swelling data for vulcanizates of a group of rubbers in several different swelling media are outlined.

847 **Special Services and Products for Users of Mechanical Goods**

By offering many special services and products, Irving B. Moore Corp. boosts sales of standard stock items.

849 **Report on a Laboratory Investigation to Develop Lightweight Refueling Hose**—By S. A. Eller, A. A. Stein, E. Solon, H. J. Borstell and C. K. Chatten

Describing the test flexing of commercially available refueling hose with an evaluation of various elastomers.

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*Appears every other month

Microfilm copies of complete volumes of RUBBER AGE are available from University Microfilms, 313 North First St., Ann Arbor, Mich.
Indexed in Industrial Arts Index and Engineering Index

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Highlights Sidelights *of the News . . .*

February, 1958

The Special Stockpile Advisory Committee has recommended the cautious disposal of some items in the nation's $7 billion stockpile of raw materials . . . The Committee has proposed that excessive supplies of perishable materials, such as rubber, should be sold but only when this can be done "without duly interfering with usual markets" . . . Present laws, it added, should be changed to give the government more flexibility in disposing of excess stocks (page 859).

Minnesota Rubber and Gasket Co. has changed its corporate name to the Minnesota Rubber Co. and completed a realignment of its five subsidiaries (page 873) . . . Following its reorganization, the firm announced the election of four new vice-presidents (page 861).

Current reports point out that the foreign operations of leading American tire companies have been accounting for a growing proportion of total earnings . . . Goodyear foreign sales, for example, are said to be contributing about 25 per cent of consolidated gross income . . . Overseas operations of Firestone are reported to be contributing about 21 per cent of net income (page 863).

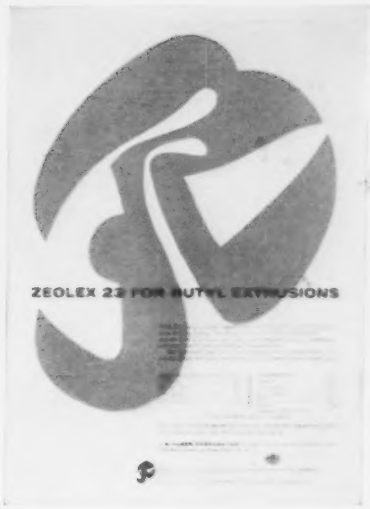
Goodyear has announced the completion of a large new pilot plant facility for the production of "Natsyn", the new synthetic rubber which has the molecular structure and performance characteristics of natural rubber . . . The new facility has a tonnage capacity which will permit extensive production-scale tire building and evaluation trials (page 859).

A tentative program has been set for the meeting of the Rubber and Plastics Industries Subcommittee, General Industries Application Committee, American Institute of Electrical Engineers, which will be held on April 14 and 15 in Akron, Ohio . . . This will be the ninth conference held on "Electrical Engineering Problems in the Rubber and Plastics Industries" (page 861).

Wooster Rubber Co. has changed its name to Rubbermaid, Inc. . . . Company officials point out that the brand name of the company had become such a valuable asset that the name change had been considered periodically in recent years . . . The trade name "Rubbermaid" was first used by the company in 1934 (page 873).

Who is This Month's "Man in the News"?
The first in a new series of articles devoted to a recognition of outstanding industry figures appears on page 871.

A BASIC SOURCE FOR COMPOUNDING NEEDS



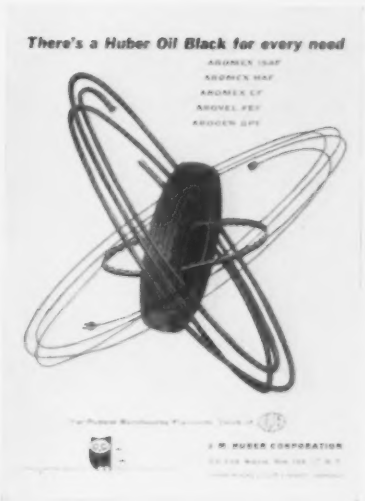
CARBON BLACKS

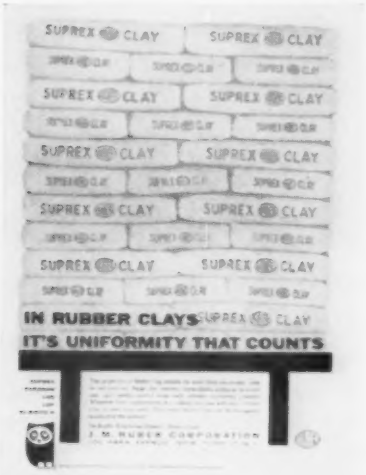
CLAYS

CHEMICALS

PIGMENTS

For Rubber Reinforcing Pigments,
Think of Huber





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ESPESOL 165's
Narrow boiling range reduces handling time — improves quality of end product!

NEW ESPESOL 165 aliphatic solvent offers rubber processors a *narrow boiling range of 165 to 225 degrees F* with a low-odor factor. This narrow cut with its low end point offers a much shorter drying time and a substantial increase in production.

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AGENT 36

SILICONE SQUAD

HOW I GAVE THE NEEDLE TO L.P.*

*LOST PRODUCTION

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MCULCER, HERE'S 36!
HE'S NOT THE DOC! I PLEAD THE FIFTH!
36
4
YOU'LL BE FIXED UP, MIXED-UP.
DOC'S AT THE SIGMA FREUD FRATERNITY REUNION. FOLLOW ME: I KNOW WHAT MAKES YOU TIC!
AGENT 36
5
YOU'RE NOT SICK, BUT YOUR MOLDS ARE. DOW CORNING SILICONES ARE THE RIGHT MEDICINE...BEST THING IN MOLDS SINCE PENICILLIN.
WHAT A RELEASE!
AGENT 36
6
SILICONES SPEED PRODUCTION, GIVE BETTER SURFACE DETAIL, QUICKER RELEASE, REDUCED SCRAP AND MOLD MAINTENANCE.
MY WORRIES ARE OVER.
36 OR BUST
7
PRODUCTION IS TERRIFIC.
DOC WILL BE SWEETHEART OF SIGMA FREUD!
WILL THIS SUCCESS SPOIL DOC HAUNTER?
AGENT 36
8
YOU CAN'T FIND A BETTER RELEASE AGENT THAN 36 EMULSION. GET YOUR FACTS. DOW CORNING'S THE SOURCE. DO IT NOW!
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More pounds per hour
Least cost per pound

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Letters to the editor

More on Nomenclature

Dear Sir:

These codes remind me of my early days in the B. F. Goodrich Company. As a new and green chemist, I found myself faced with the problem of learning the true names, the trade names, code names and code numbers of all materials used in compounding — even at that time more than a thousand of them. In addition to that, there were numerical ciphers. The recipes which were sent to the millroom were numbers written in these ciphers. The only object of all this detail was secrecy. After considerable experience, I found it necessary to carry a code book with me at all times, but names were readily remembered.

I have a high respect for Dr. Garvey and his collaborators and am impressed by the results of what, undoubtedly, was a conscientious study. However, whether we like it or not, I believe that these new codes will serve secrecy rather than clarification. Then, too, there are large numbers of people who are not trained in organic chemistry and yet who wish to understand something about these numerous substances which are used by the rubber industry. They, constituting the majority would, I believe, prefer to use the English language. Definitions in the simplest and fewest words for each of these substances should be clear and serve the purpose of relieving confusion in this somewhat complex field.

There is one other thought. The retention of historical names which have been accepted and, therefore, understood by the majority of people who use them, is wise. Public use and acceptance has a logical and powerful influence. The word "rubber", for instance, no longer has a use connotation. If a change were to be made, which was considered many years ago, some other word (and there are several) would be better, but not one based upon its chemical composition. Again, the terms "Government Rubber Styrene" or "general purpose rubber" are understood and accepted. They are historical and, even though no longer under Government control, could be retained. Other illustrations are obvious.

Although this letter does not specifically discuss any of the points you so ably raised in your editorial of last October, it does give my idea of the whole subject.

WILLIAM C. GEER
220 Comstock Rd.
P. O. Box 573
Ithaca, N. Y.

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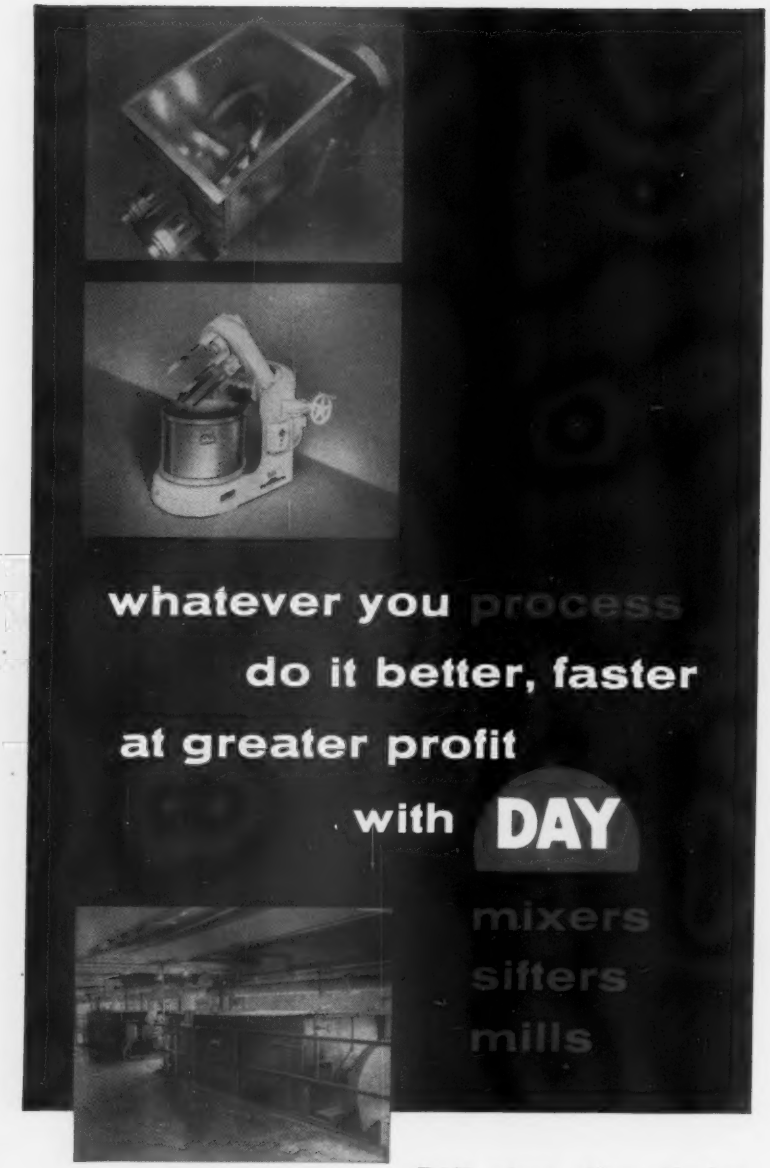

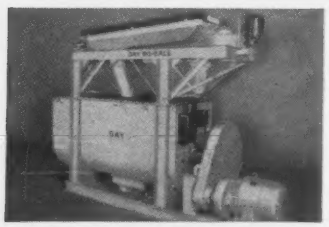

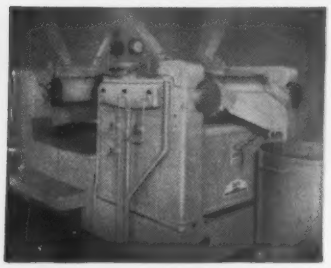

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Division of The Cleveland Automatic Machine Company

4918 Beech Street, Cincinnati 12, Ohio

Dear Sir:

I read with considerable interest your editorial concerning Nomenclature in the October, 1957, issue of RUBBER AGE. I concur wholeheartedly with your comments.

A. H. WOODWARD

E. I. du Pont de Nemours & Co.,
1750 N. Olden Ave. Ext.,
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Dear Sir:

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Optimistic Editorial

Dear Sir:

Congratulations on the editorial in the January issue. It is like a breath of fresh air to see someone brave enough to be optimistic in view of all the pessimistic news from the business advisory services. I agree with your sentiments at least 75% and hope that both of us are wrong by being too low in our expectations for good business in 1958.

DONALD F. FRASER

Garlock Packing Co.
Palmyra, N. Y.

Review and Preview

Dear Sir:

In the writer's opinion, this is an excellent coverage of the subject. Congratulations! If you have extra copies of that reprint, we would appreciate having three more to distribute to interested members of our office.

G. P. KURTZ

G. M. Basford Co.,
Cleveland 14, Ohio

. . . We have received from you a reprint of the Review and Preview of the Rubber Industry which appeared in the last issue of the RUBBER AGE. We would like to send copies of this reprint to some of the foreign rubber companies with whom we have technical connections. Even though most of these people take RUBBER AGE, we think this particular article will be of interest to the top management of those companies.

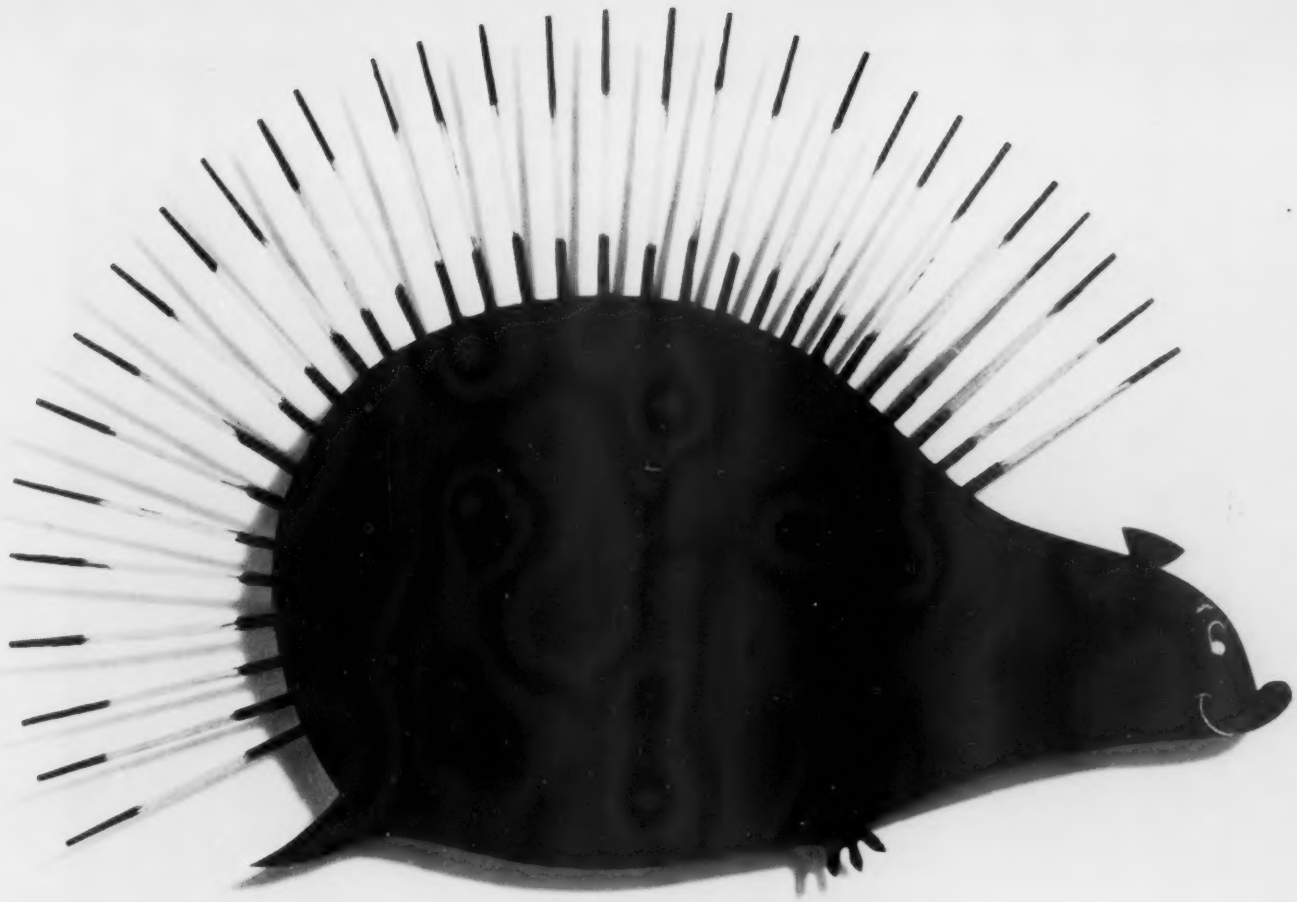
R. M. REEL

Dayton Rubber Export Co.,
Dayton 1, Ohio

. . . We would appreciate receiving at least six reprints of the "1957-1958 Review and Preview of the Rubber Industry". Congratulations to you all upon a worthwhile job well done.

(Mrs.) S. G. COPITHORNE

Godfrey L. Cabot, Inc.
Boston 10, Mass.



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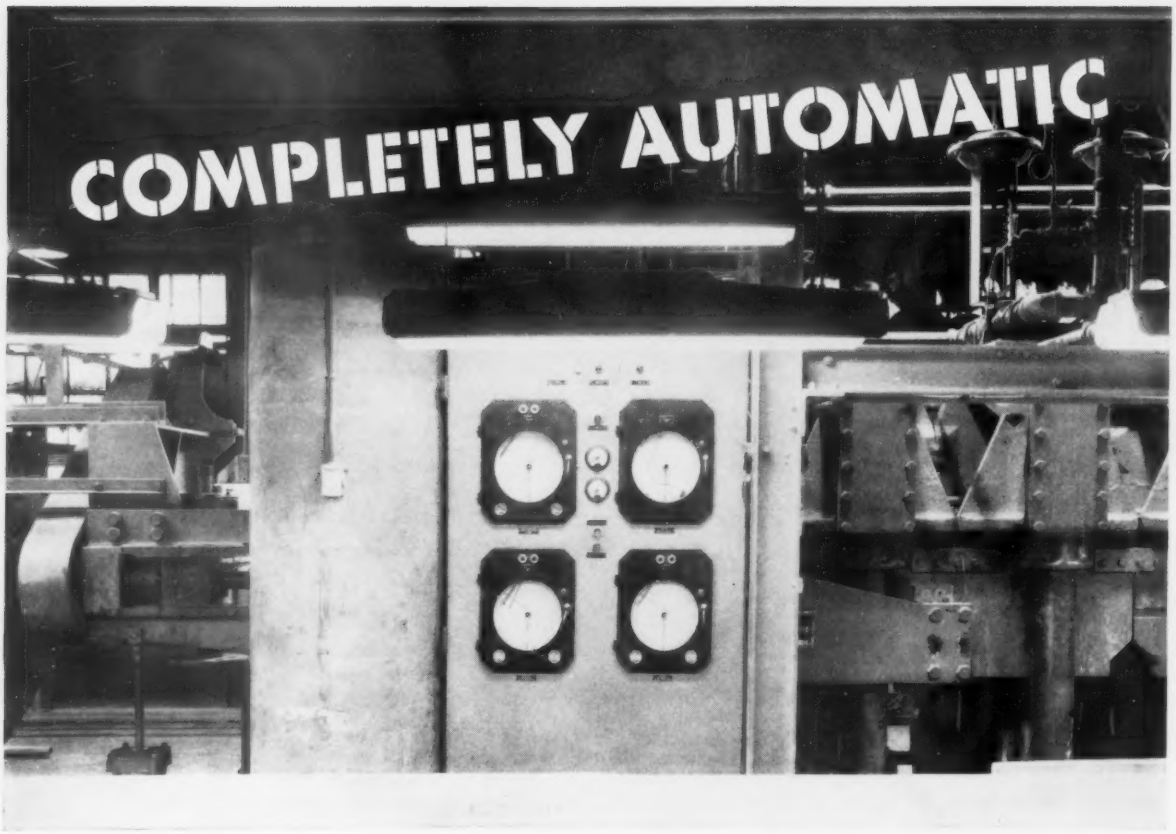

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4. Taylor Recording Controllers give you a complete record of the number of cures run per day, as well as the temperature, time and force exerted during each cure. This is a valuable aid both in planning products and in evaluating down time.

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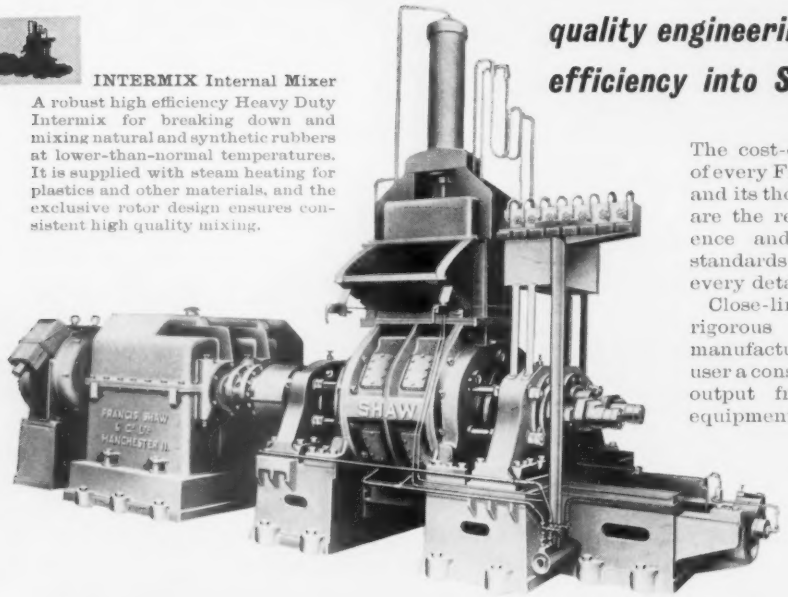

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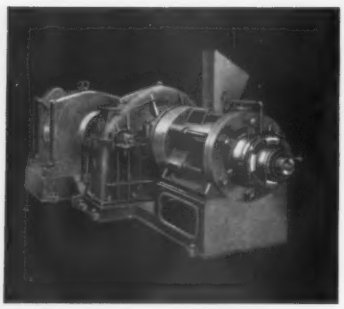

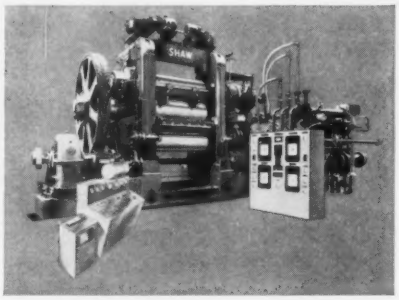

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P.4894

Photo courtesy of the New Jersey Rubber Company, Taunton, Mass.

One thing all America is soled on

The first steps in the development of a synthetic shoe sole were taken in the early 1930's. It was introduced commercially shortly after World War II. Since that time, this lightweight, waterproof, long-wearing blend of synthetic rubber and resin has grown in acceptance to where it is now used on just about 65% of all shoes of all types produced in these United States. And its use is still spreading.

Constant improvement in both raw materials and compounding techniques has been the key to the success of these soles. It's also the reason why PLIOFLEX rubber and PLIOLITE S-6B, the reinforcing resin by Goodyear, are so widely used by sole manufacturers.

The main advantage of PLIOFLEX in shoe soles is its unusually light color and high uniformity. With PLIOLITE S-6B, the advantages lie in superior processability and reinforcing properties. And with both materials, there's unmatched technical assistance and service.

If you are looking for top-quality shoe soles or any rubber product where hardness, stiffness, or toughness properties are important, be sure you have the full story on PLIOFLEX and PLIOLITE S-6B. It's yours simply by writing Goodyear, Chemical Division, Dept. N-9419, Akron 16, Ohio.

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Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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It used to be that "O"-ring failures were all too frequent. Ordinary rubber could not withstand the various hydraulic fluids, the −40°F. to 160°F. temperatures, the flexing, the stretching, the elongation. But the picture changed when Goodyear introduced CHEMIGUM—first of the truly oil-resistant rubbers.

The unique composition of CHEMIGUM soon made possible "O"-rings with an absolute minimum of swell or shrinkage, excellent resistance to heat and cold, very low compression set and maximum squeeze combined with minimum friction. And its easy processing permitted meeting tolerances in the very low thousandths of an inch.

Perhaps the fate of your product also can be assured a success by CHEMIGUM. For full details plus the finest in technical service, just write to

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What styrene resin for reinforcing synthetic rubber?

The charts reproduced at right represent just some of the reasons for reinforcing styrene rubber with PLIOLITE S-6B.

Besides its decided improvement of physical properties in general, PLIOLITE S-6B offers two other major benefits. First, it serves as a processing aid. And second, it functions as an indirect cost-cutter.

PLIOLITE S-6B works as a processing aid by acting as a plasticizer at elevated temperatures to provide smooth-running, easy-flowing stocks of reduced nerve. It also improves mold reproduction and minimizes warpage and shrinkage of extruded goods.

PLIOLITE S-6B helps cut costs by permitting lighter-weight stocks and/or the use of larger amounts of fillers. It also makes possible substantial economies in mixing, forming and curing, reduces rejects and permits easier work-away of cured scrap.

You'll also find a number of other advantages to compounding styrene rubber with PLIOLITE S-6B. Details plus the latest *Tech Book Bulletins* are yours by writing to:

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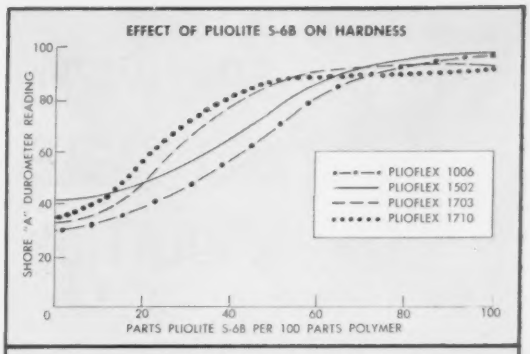

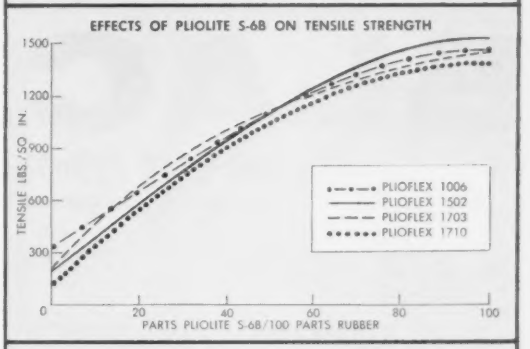

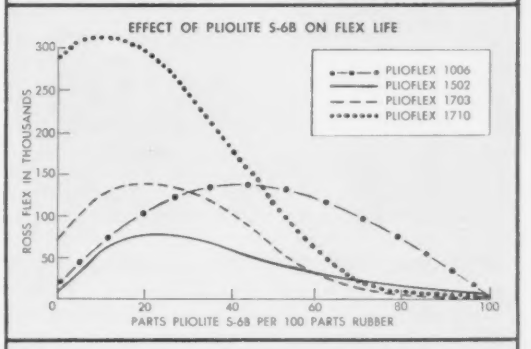

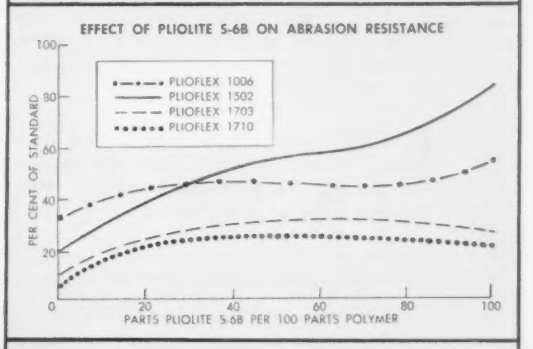

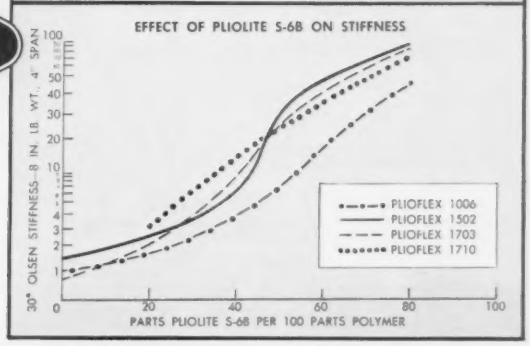
EFFECT OF PLIOLITE S-6B ON STIFFNESS
30° OLSEN STIFFNESS—8 IN. LB. WT. 4" SPAN
PARTS PLIOLITE S-6B PER 100 PARTS POLYMER
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PLIOFLEX 1502
PLIOFLEX 1703
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COMING

Mar. 20. Quebec Rubber and Plastics Group.

Mar. 28. New York Rubber Group, Spring Meeting, Henry Hudson Hotel, New York, N. Y.

April 10. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

April 11. Akron Rubber Group, Spring Meeting, Sheraton-Mayflower Hotel, Akron, Ohio.

April 16. Washington Rubber Group.

April 17. Quebec Rubber and Plastics Group.

April 25. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

May 14-16. Division of Rubber Chemistry, A.C.S., Spring Meeting, Netherlands Plaza Hotel, Cincinnati, Ohio.

May 21. Washington Rubber Group.

May 23. Connecticut Rubber Group.

June 5. New York Rubber Group, Summer Outing, Doerr's Grove, Milburn, N. J.

June 20. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 22-28. A.S.T.M. Annual Meeting, Hotel Statler, Boston, Mass.

July 25. Chicago Rubber Group, Golf Outing, Medinah Country Club, Medinah, Ill.

Aug. 5. New York Rubber Group, Golf Outing, Wingfoot Golf Club, Mamaroneck, N. Y.

Sept. 6. Connecticut Rubber Group, Summer Outing.

EVENTS

Sept. 10-12. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

Oct. 17. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Oct. 24. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Nov. 14. Connecticut Rubber Group.

Nov. 17-21. Society of the Plastics Industry Annual National Conference, Morrison Hotel, Chicago, Ill.

Nov. 30-Dec. 5. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 12. New York Rubber Group, Xmas Party.

May 12-15, 1959. Division of Rubber Chemistry, A.C.S. Spring Meeting, Biltmore Hotel, Los Angeles, Calif.

Nov. 9-13, 1959. Joint International Meeting of Division of Rubber Chemistry, A.C.S.; Committee D-11, A.S.T.M., and Rubber and Plastics Division, A.S.M.E., Shoreham Hotel, Washington, D. C.

May 24-27, 1960. Division of Rubber Chemistry, A.C.S., Spring Meeting, Hotel Statler, Buffalo, N. Y.

Sept. 13-16, 1960. Division of Rubber Chemistry, A.C.S., Fall Meeting, Commodore Hotel, New York, N. Y.

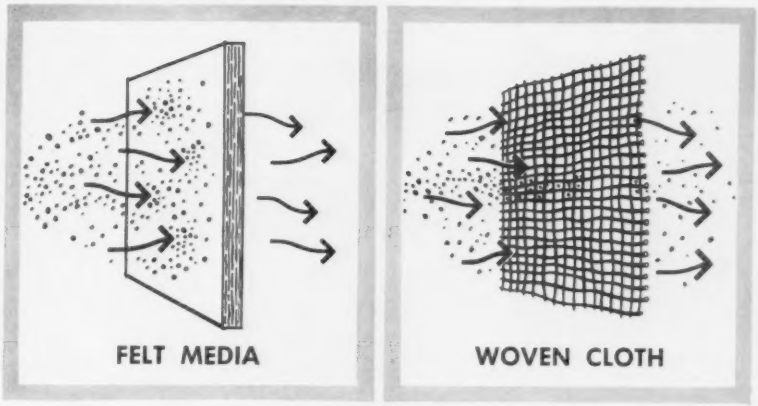
May 16-19, 1961. Division of Rubber Chemistry, A.C.S., Spring Meeting, Brown Hotel, Louisville, Ky.

Sept. 5-8, 1961. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

May 15-18, 1962. Division of Rubber Chemistry, A.C.S., Spring Meeting, Hotel Statler, Boston, Mass.

DAY

DUST CONTROL NEWS



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Consider this important fact. What happens when these two media are cleaned? Woven cloth is cleaned by shaking, rapping or low velocity reverse air. In many cases woven cloth is overcleaned, permitting leakage until openings between strands are again plugged with dust. The overall performance is one of erratic back pressure and filtering efficiency. *With DAY filters the porosity of the felt media is maintained by automatic counter flow air. Back pressure doesn't vary and peak filtering efficiency is constantly maintained.*

Whether your problem is collecting and recovering valuable dust or controlling dangerous or obnoxious dust; write for our free bulletin "DUST FILTER FACTS." Read this bulletin carefully before you decide on *any* dust filter. It contains useful charts and air engineering data. It also contains more information about the many services and equipment available from DAY. Write toDAY for Bulletin F-75.

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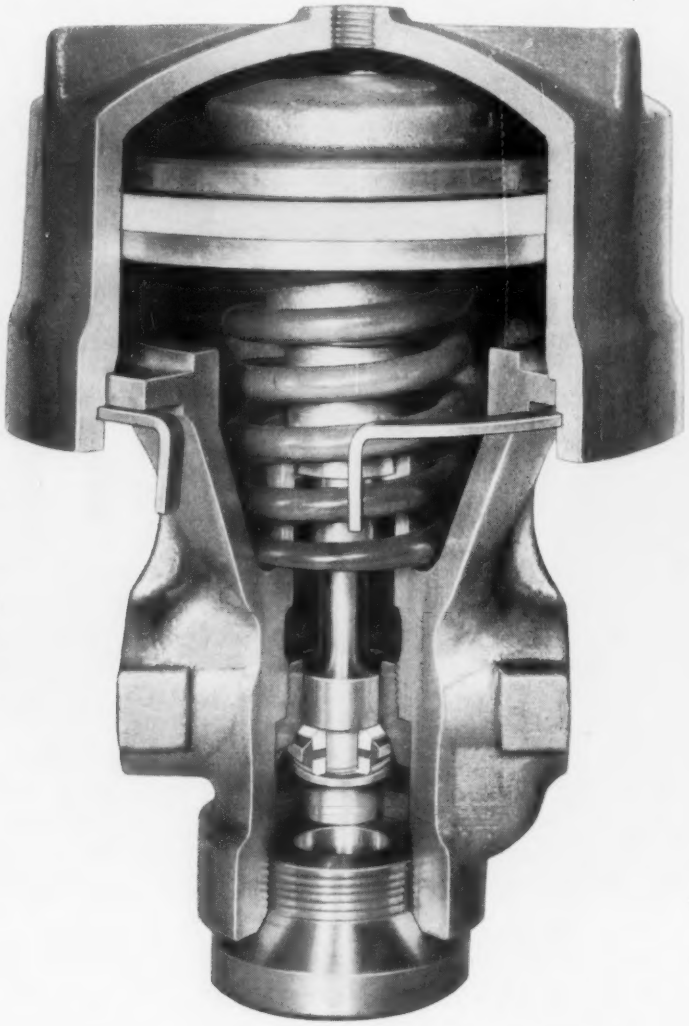

Type D532 is typical of Merit semi-balanced, cylinder operated, air 50 to 100 psi. 2-way normally open, normally closed, and 3-way valves. Pressure to 750 psi. Bronze body. Screw connections. Size ⅛" to 2½".

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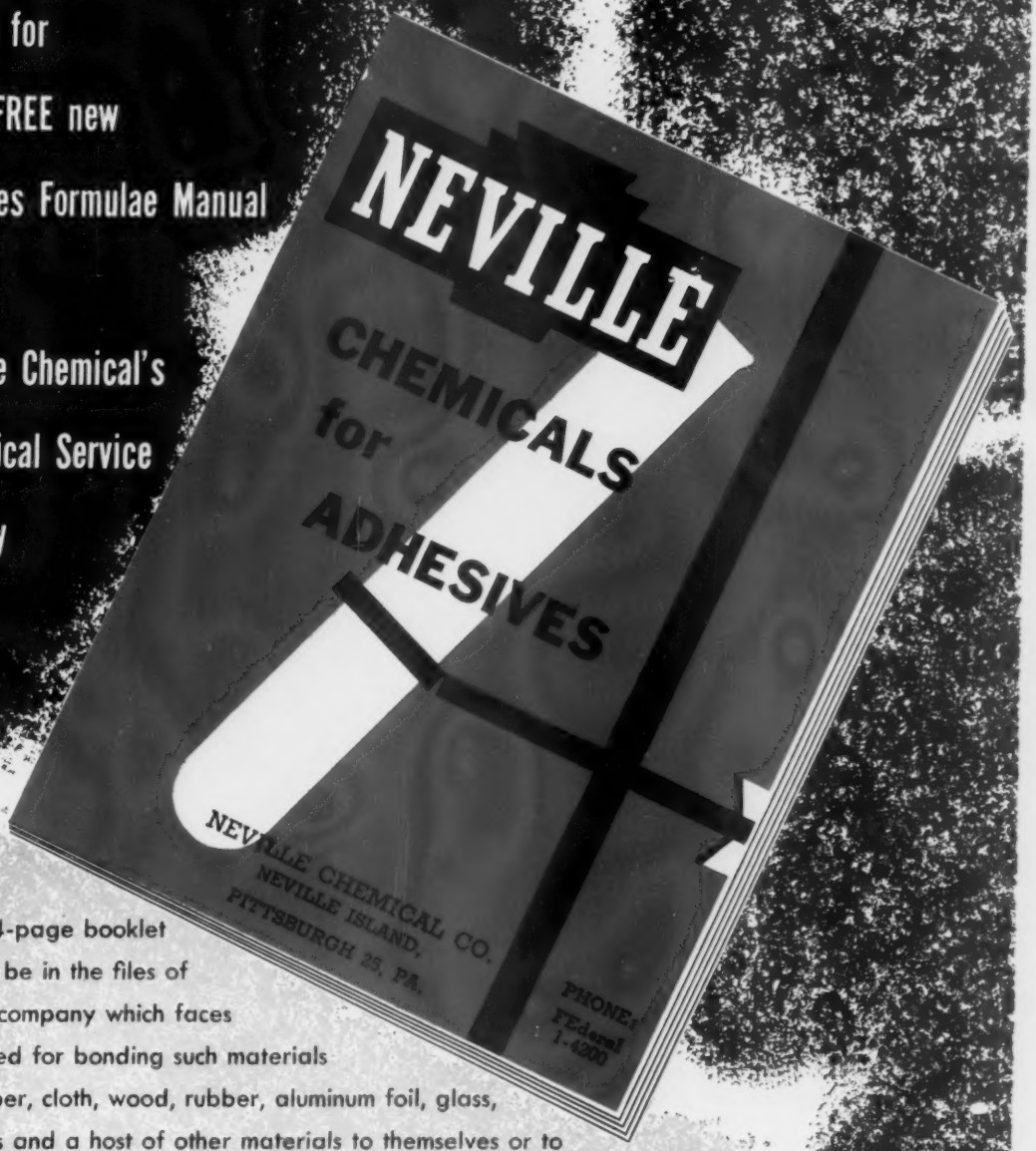

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Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

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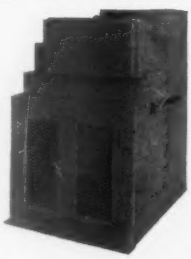

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PATENT REVIEW

by Melvin Nord

Production of a Porous Vinyl Ester

U.S. 2,802,796, issued August 13, 1957 to Harry A. Toulmin, Jr., and William R. Stauffer, provides a method of production of rubber sponge from synthetic latex, preventing the coagulation of the rubber which increases the particle size.

When neoprene latex is impregnated with nitrous oxide, it is necessary to cool it in order to prevent coagulation. However, this can be avoided by the addition of sodium silicate in a quantity up to 20 per cent of the volume of the latex. In this way, it is possible to foam neoprene latex with nitrous oxide, without refrigeration.

Low-Hysteresis Rubber-Carbon Black Mixes

U.S. 2,802,806, issued August 13, 1957 to Kenneth W. Doak and assigned to United States Rubber Co., provides a new chemical promoter for the processing of rubber and carbon black mixes to obtain high electrical resistance and low torsional hysteresis of tread stocks.

It has been found that hexachloropropene substantially decreases the time and/or lowers the temperature required for low-hysteresis processing of mixtures of rubber and carbon black. It is particularly effective in natural rubber, synthetic rubbery homopolymers of butadiene and isoprene, and synthetic rubbery copolymers of these diolefins with isobutylene, styrene, alpha-methyl styrene, methyl acrylate, ethyl acrylate, methyl methacrylate, acrylonitrile, methyl vinyl ketone, methyl isopropenyl ketone and monovinylpyridine.

Organic Peroxide Vulcanization of Latex

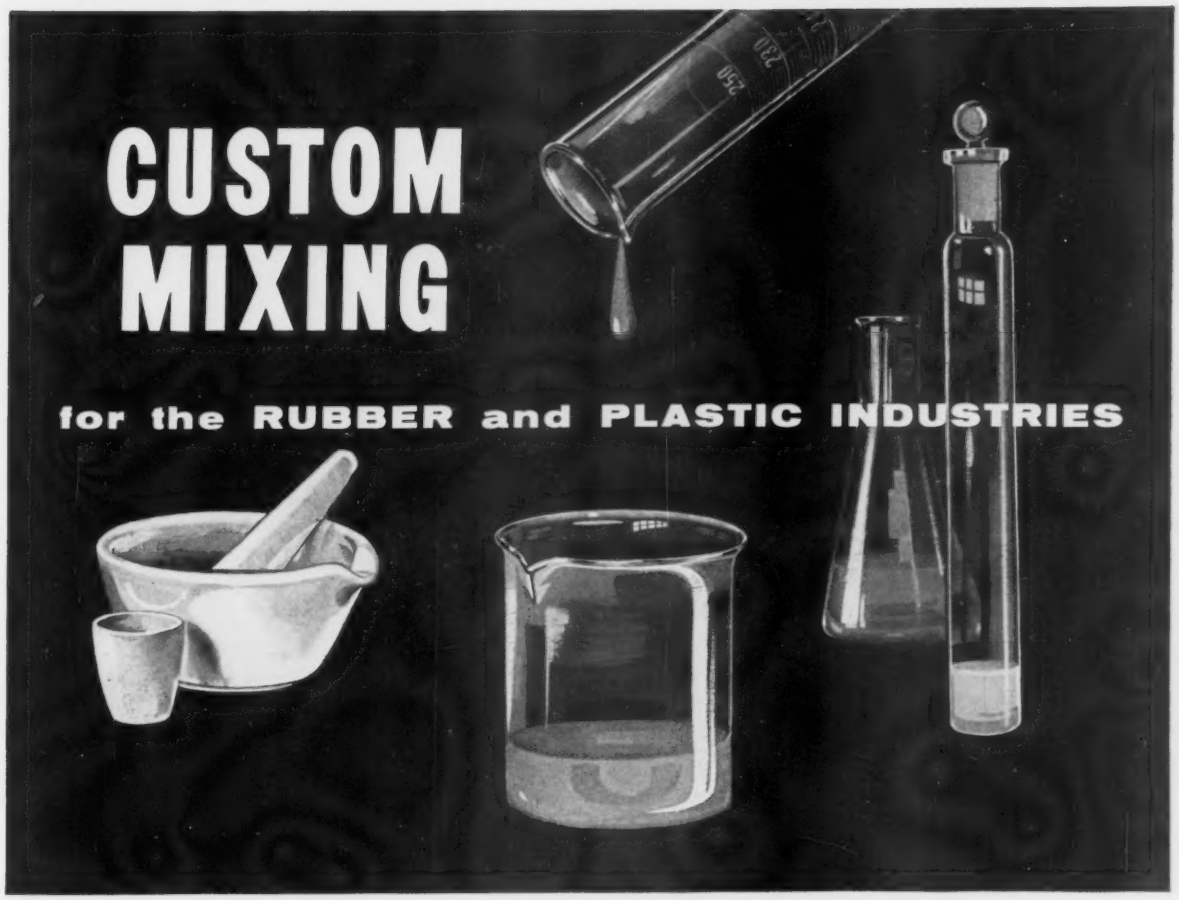
U.S. 2,802,891, issued August 13, 1957, to George P. Field and Walter S. Ropp, assigned to Hercules Powder Co., describes a process for vulcanizing rubber latex with an organic peroxide of the monoperoxyacetal type.

It is pointed out in the patent that the most commonly used organic peroxide, benzoyl peroxide cannot vulcanize latex satisfactorily; rubber films vulcanized with this material are permanently deformed when stretched. However, rubber films produced by vulcanization of latex with the monoperoxyacetal compounds exhibit substantially no permanent deformation when stretched.

High Grade Rubber from Rubber Latex

U.S. 2,802,893, issued August 13, 1957 to Arthur I. Rand and Glenn A. Kidder, assigned to Firestone Tire & Rubber Co., provides a method for producing high grade rubber from rubber latex.

Skim latex, resulting from centrifugal concentration of a natural rubber latex, is allowed to coagulate spontaneously in an open vat or tank. The resulting coagulum



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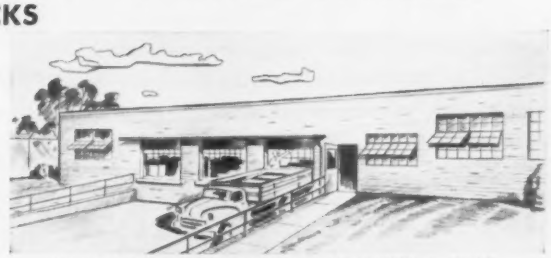

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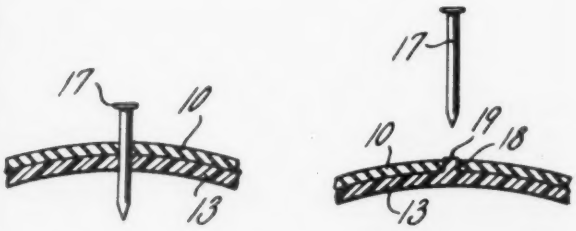
PATENT REVIEW

is reduced to a wet crumb or lacy crepe by milling. The crumb or crepe rubber is treated with an aqueous solution of an alkali metal hydroxide or ammonium hydroxide, and is then washed and dried.

Puncture-Sealing Tire

U.S. 2,802,505, issued August 13, 1957 to Lester C. Peterson and Harvey J. Batts, assigned to United States Rubber Co., relates to pneumatic tires or inner tubes containing a layer of puncture-sealing material which is so formulated as to be capable of acquiring an exact but limited degree of cure in the course of the conventional vulcanizing cycle to which tires or tubes are subjected.



The invention is based on the principle of compounding an essentially permanently plastic material with a lesser amount of a different material that is adapted to be vulcanized to a typical rubbery, elastic state. Such vulcanized, elastic material serves to impart to the otherwise permanently plastic material a certain degree of immobility and elasticity, whereby the plastic material is at once restrained in its proper operative location, and also is rendered just sufficiently elastic to perform the desired puncture-sealing function.

A typical composition is as follows: 80 to 97.5 parts of raw butyl rubber as the permanently plastic portion of the mixture, and 2.5 to 20 parts of the polychloroprene or neoprene type of synthetic rubber as the constituent which is vulcanized to an elastic state for the purpose of imparting immobility. The mixture also includes a specific vulcanizing agent for the neoprene constituent, such as an acidic metal halide. The puncture-sealing action is shown in the illustration.

High-Frequency Electric Heating of Tires

U.S. 2,797,440, and 2,797,441, issued July 2, 1957 to Heinrich A. Bauermeister and Hans-Dieter Krug, assigned to Continental Gummi-Werke A.G., relates to the preheating or vulcanization of pneumatic tires in an electric high-frequency alternating current field.

Difficulties are encountered in heating such bodies uniformly, because they do not have uniform wall thickness and contain materials of different dielectric coefficients. These difficulties are overcome in the present invention by arranging additional electrodes at those

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'Sharples' brand ETHYLAC . . . widely used as a primary accelerator . . . has now shown outstanding characteristics as a delayed action activator. Here are the results of a study based on a general purpose, intermediate modulus, high quality compound . . . a type usually accelerated with a thiazole accelerator. ETHYLAC was added at two levels as an activator.

MBTS Activated with ETHYLAC

Compound	1	2	3
Smoked Sheet Blend	100.0	100.0	100.0
HAF Black	50.0	50.0	50.0
Zinc Oxide	5.0	5.0	5.0
Stearic Acid	3.0	3.0	3.0
Pine Tar	3.0	3.0	3.0
Antioxidant	1.0	1.0	1.0
Sulfur	2.25	2.25	2.25
MBTS	1.0	1.0	1.0
ETHYLAC	0.0	0.4	0.8
Total	165.25	165.65	166.05

Mooney Scorch

T-5 @ 248°F.	18.0	19.5	17.9
T-5 @ 266°F.	10.3	10.6	10.3

Cure—Min. @ 284°F.	M300	T	E	H	M300	T	E	H	M300	T	E	H
10	1225	3275	610	57	1800	3700	600	61	1825	3900	600	65
20	1725	3825	600	65	2625	3450	410	74	2900	3675	400	75
30	2025	3825	530	68	2900	3425	380	75	3025	3200	320	76
40	2100	3975	530	66	3100	3400	350	73	3150	3150	300	77

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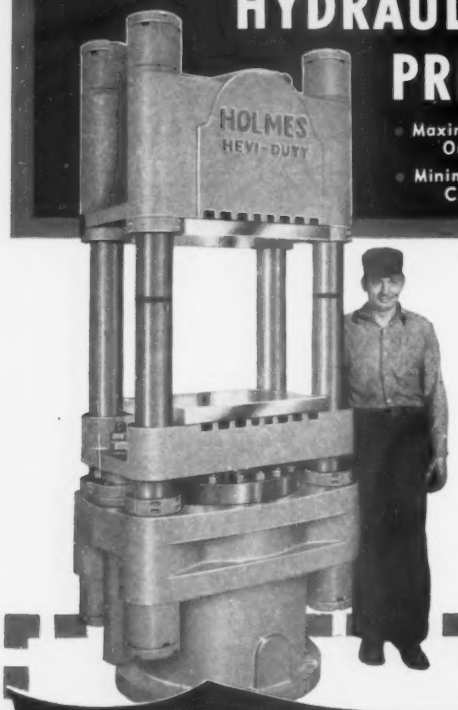

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PATENT REVIEW

points of the tire where accumulations of material occur or where the layers making up the tire have a different dielectric coefficient.

Vehicle Tire Ballast

U.S. 2,797,721, issued July 2, 1957 to William L. Hicks, provides a liquid ballast for tires, for use on sandy ground, where the coefficient of friction is low.

The liquid used has a viscosity of 300 to 10,000 cps absolute viscosity when measured at 70°F. The preferred material is a barytes suspension, with a thickener material such as cornstarch added. The liquid is pumped directly into the tire, without the use of a tube. The weight of the liquid pushes the sidewalls out against the rim of the tire, and because of its viscosity acts as a sealing medium. The tire is filled to about 75 to 90 per cent full with the liquid, the rest being left for air under pressure. There is practically no loping or jerking due to splashing of the liquid in the tire.

Cork Asbestos Elastomer Sheet

U.S. 2,799,578, issued July 16, 1957 to Stephen M. Lillis and John C. Toman, assigned to Victor Manufacturing & Gasket Co., describes a composition of asbestos, cork, and neoprene that can be formed upon a wet lap cylinder papermaking machine into fibrous sheets from which gaskets can be cut.

The object is to obtain advantages in compressibility and recovery from the use of large particles of cork (50 mesh) without sacrificing uniformity of distribution of the particles in the sheet. A wetting agent is used to aid in this distribution.

Aqueous Dispersions of Elastomers

U. S. 2,799,662, issued July 16, 1957 to John L. Ernst and Joseph L. Betts, Jr., assigned to Esso Research and Engineering Co., provides a process for preparing latices of synthetic elastomers such is isobutylene polymers from dry polymers, using a critical combination of dispersing and finishing conditions.

The polymeric material, containing polymerized isobutylene, is dissolved in a suitable solvent of the aliphatic hydrocarbon or of the ketone type, depending on the polymer. This solution is then dispersed in a water-emulsifier system containing two emulsifiers, one of the type which is hydrocarbon-soluble (e.g., an alkali metal petroleum sulfonate) and one of the water-soluble (e.g., Tergitol). The polymer-solvent mixture and the aqueous emulsifier mixture are prechilled to a temperature below the boiling point of the solvent, to prevent solvent flashing and consequent coagulation. The emulsification is accomplished under conditions using a high shear device for agitation. After formation of the emulsion is complete, the polymer solvent is removed by stripping or flashing, under vacuum. After removal of the solvent, the dispersion of polymer in water is drawn

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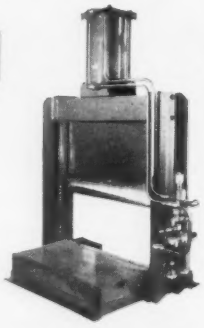

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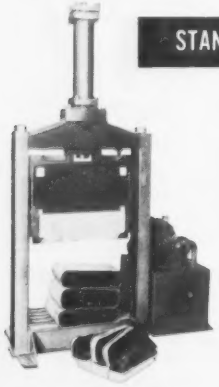

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PATENT REVIEW

off and allowed to cream. A stabilizing agent may be added, as well as a preservative.

Preservation of Latex

U.S. 2,802,039 and 2,802,040, issued August 6, 1957 to Walter T. L. Ten Broeck, Jr., assigned to Goodyear Tire & Rubber Co., describe methods for increasing the mechanical stability of latex and stabilizing the KOH value or acidity.

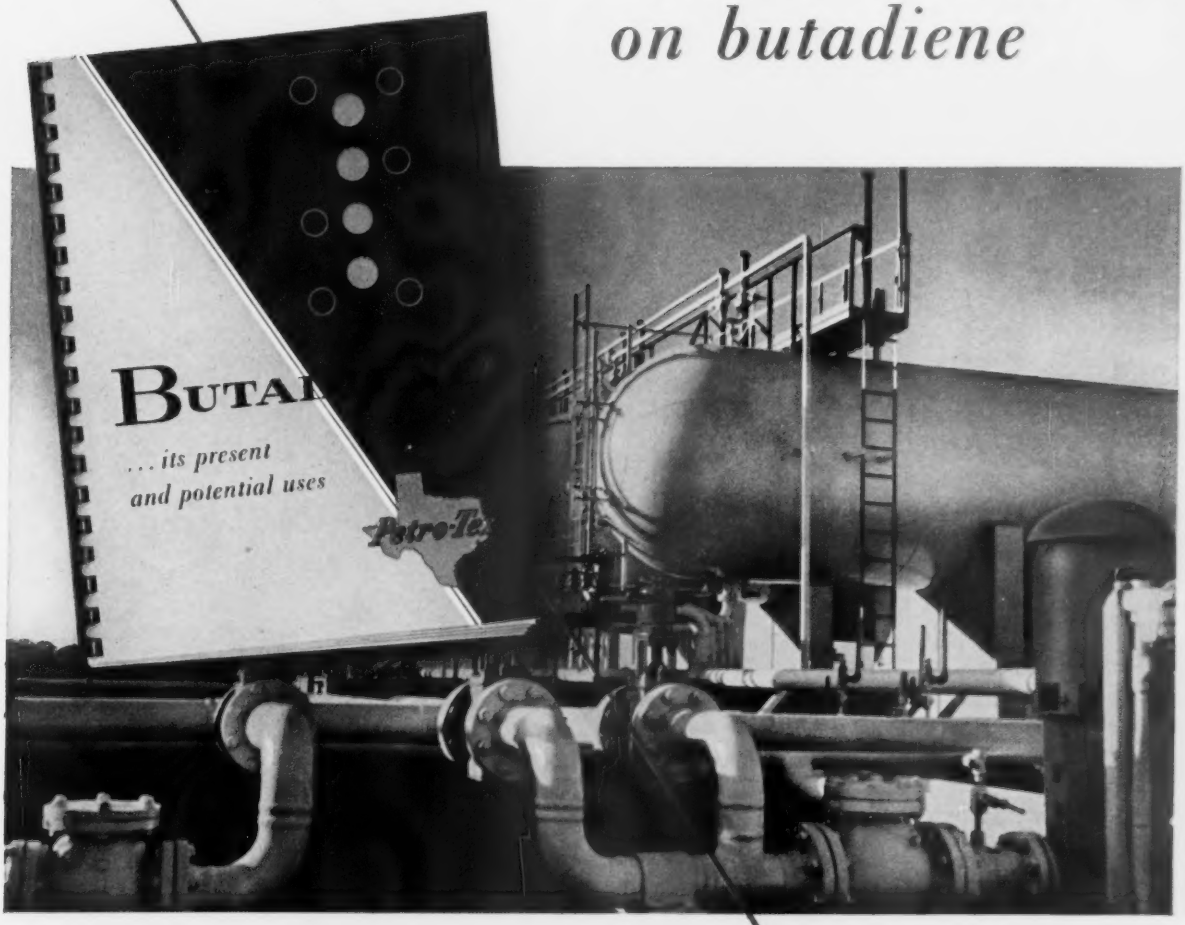
Natural rubber latex is treated preliminarily with formaldehyde and a fixed alkali (KOH or NaOH), the treatment being effected as soon after tapping as possible. Sufficient alkali is added to maintain the pH between 9.5 and 10.5. All the polyvalent ions, e.g., Mg and Ca, are precipitated from the latex. These are undesirable, since they react with naturally occurring fatty acids and rosin-type constituents in latex to form insoluble soaps and thus prevent these from forming soluble soaps with monovalent radicals. Also, they react with and kill the soluble soaps added in processing latex into sponge rubber and other useful articles. The formaldehyde destroys bacteria and enzymes causing putrefaction.

Other Patents Of Interest

Subject	Inventor or Assignee	Patent No.	Date
Method of producing tire molds	Paul C. Hawkinson Co.	2,794,351	6/4/57
Tire siping machine	General Tire & Rubber Co.	2,794,503	6/4/57
Universal vulcanizer	Bowes Seal Fast Corp.	2,795,007	6/11/57
Device for mounting and dismounting tubeless tires on drop center rims	Charles E. Branick	2,795,268	6/11/57
Automatic blank cutter	United States Rubber Co.	2,795,275	6/11/57
Method of calendering a plastic mass	Johnson & Johnson	2,795,521	6/11/57
Tire removing device with circumferentially distributed pivoted thrust member	Martin Pientkewic	2,796,117	6/18/57
Chair back support	General Tire & Rubber Co.	2,796,920	6/25/57

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.

Send for this technical manual on butadiene



Within the 48 pages of this first comprehensive technical manual on Butadiene is a wealth of fundamental data, much of which has been hitherto locked up in laboratory notebooks. Included are:

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If you are interested, we will be pleased to send you this Butadiene Manual. Kindly address your request to us at P.O. Box 2584, Houston 1, Texas.

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How Are Compounds Recorded?

The method of recording and sorting the compounds is by the use of a punched card system. The punched card system of classifying scientific data has found wide application in recent years wherever data are collected and sorted for statistical or other systematic purposes requiring quick and easy operation. Individual filing cards are provided and each card is automatically cross-indexed.

How Is It Issued?

THE RUBBER FORMULARY is sold on an annual subscription basis (by calendar year) and is issued in a monthly shipment of cards. Each month's issue contains compounds published regularly in periodicals and technical releases of suppliers to the rubber industry. Each shipment is accompanied by a table of contents (in loose-leaf form) listing the compounds and their source.

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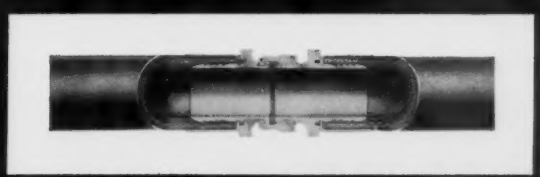

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Capitol Cues

ONE OF THE MOST CRITICAL CONGRESSIONAL SESSIONS of recent years has just begun in Washington. It may well go down in history as the "Sputnik" Session. Already, it is clear that the overriding issues will center about how to build American strength for survival in the Space Age now dawning. But there'll also be considerable concern focused on the slide in business.

Just how these problems should be tackled still isn't clear. Most lawmakers just aren't sure what can—or should—be done. That's why this will be another big year for investigations—of missiles...satellites...unemployment...and labor rackets.

The gravity of the situation won't rule out politics, though. This is an election year and Democrats think they have the GOP on the run because of missile lags and rising unemployment. But Republicans will back investigations, too, to demonstrate to the home-folks that they are also opposed to complacency.

The dominant concern for defense will affect the voting on a long list of issues—Budget...tax...school...and foreign aid.

THE BUDGET THAT CONGRESS WILL VOTE for fiscal 1959—beginning next July 1—will be the highest in the country's peacetime history. To start with, the President is suggesting a substantial hike over current spending, to pay for more missiles, education, foreign aid, and other "defense" items. But he wants to cut some nondefense programs to keep the Budget in balance.

Congress, however, is in a spending mood and will write its own Budget. It will push for even more defense spending than the President proposes. And it won't slash those nondefense programs—veterans benefits, farm aid, housing—that so many lawmakers think their voters want. Result may be a federal deficit of $2 to $3 billion for fiscal '59—first in 4 years.

THE CHANCES OF TAX CUTS FOR INDIVIDUALS have diminished as a result of the deficit that now looms for fiscal 1959. But the door cannot yet be closed all the way—not before Spring. The picture will change, if business gets worse than expected. Congress would stop worrying about a big deficit and rush to cut rates—perhaps 10%—by raising exemptions from $600 to $700. Corporations will have to wait two years or more before they get any relief.

There'll be tax action of a technical kind to plug loopholes, and ease up on some specific hard-pressed groups of tax payers. Relief for small corporations—through cutting the rate on the first $25,000 of income—has no real chance of passage in 1958.

Here are some of the special changes that do have a chance:

- Estate taxes may be made payable over 10-year periods where prompt payment forces distress sale of a sound enterprise.
- Rapid depreciation of newly purchased used equipment may be permitted under regulations like those current on new items.
- Retail excises may be revised to make for more consistency.
- Non-payment of social security and income taxes withheld from payrolls will bring stiffer penalties for those who "borrow."

The House has passed some of these and many Senators approve.

Continued on Next Page

CONGRESS WILL HAVE TO LIFT THE DEBT LIMIT at the current session. The Treasury can get along till June 30 under the present $275 billion lid. But as spending outstrips income, the top will have to go to $280 billion.

THE PRESIDENT'S FOREIGN TRADE POLICIES are likely to touch off maybe the hottest nondefense-connected battle of the current session of Congress. The lines are already drawn, and the propoganda mills have long been grinding. At immediate issue will be extension of the Reciprocal Trade Agreements Act.

- Free traders want to extend Eisenhower's powers to negotiate trade agreements for five more years. They also want to give him power to cut tariffs 5% a year, and ratify U.S. membership in the Organization for Trade Cooperation, which speeds cuts.
- Protectionists want to block these measures or amend the law to give the Tariff Commission power to raise duties when an industry is hurt by imports. (Ike has power but rarely uses.)

Protectionists are strong, with union and Southern support. Ultimately, extension will be voted, as is, with no shift in authority to the Commission. OTC membership will be blocked.

FEDERAL AID TO EDUCATION WILL FINALLY BE VOTED THIS YEAR, a reaction to Russia's missile-satellite achievements. The funds will not be used for classrooms; the emphasis will be on science training and scholarship help. There'll be money for graduate-research fellowships, more aptitude testing, improved science and mathematics teaching, and equipment for college labs. The first-year cost to the Treasury will run between $200 and $300 million.

THERE'LL BE SOME DEBATE OVER PRESIDENTIAL DISABILITY and what should be done about it. The President's latest illness has brought this up again. Likeliest change is a Constitutional amendment to permit the Vice President to take over the President's duties, subject to the approval of the Cabinet. But it is doubtful whether Congress will submit the question to the states.

CONSIDERABLE LEGISLATION OF INTEREST TO BUSINESS will be taken up by Congress next year, despite the emphasis on missile-crisis questions. Most of it will have second priority, and will be handled after the lawmakers get through with Budget and related issues. But even after these measures are considered, few will be approved. Politics or special factors will block.

Here is a rundown on some of this other legislation:

- Antitrust: Bills to require advance notice of big mergers to the government—and to put packers under Federal Trade Comm. rules—may pass. Nothing will happen on price discrimination.
- Social Security: Democrats will try for lower retirement ages and bigger benefits. But they won't put them over this year.
- Natural gas: Freeing prices of U.S. control will fail again.
- Transportation: Railroads will ask Congress to let ICC fix rates without regard to other carriers. Truckers will block.
- Postal rates: Higher first, second, and third-class rates will be voted, with pay hikes for postal and other U.S. workers.
- Atomic energy: Congress may finally authorize federal building and ownership of power units and research exchange with Allies.
- Small Business. Its U.S. agency will go on two years more.
- Housing: Little action; the GI program will wind up in July.

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Stability of Ammoniated Latex and Soap-Stabilized Emulsions in the Presence of Complex Zinc Salts. *T. S. McRoberts.*
Variability of Hevea Latex. *W. L. Resing.*
Zinc Oxide Testing of Latex. *E. W. Madge, H. M. Collier,* and *J. L. M. Newnham.*
Hevea Latex: Its Structure and Viscosity. *G. Verhaar.*
Contribution to the Study of Mineral Elements in Field Latex. *E. R. Beaufils.*
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Evaluation of Synthetic Rubbers and Latices. *I. D. Patterson.*
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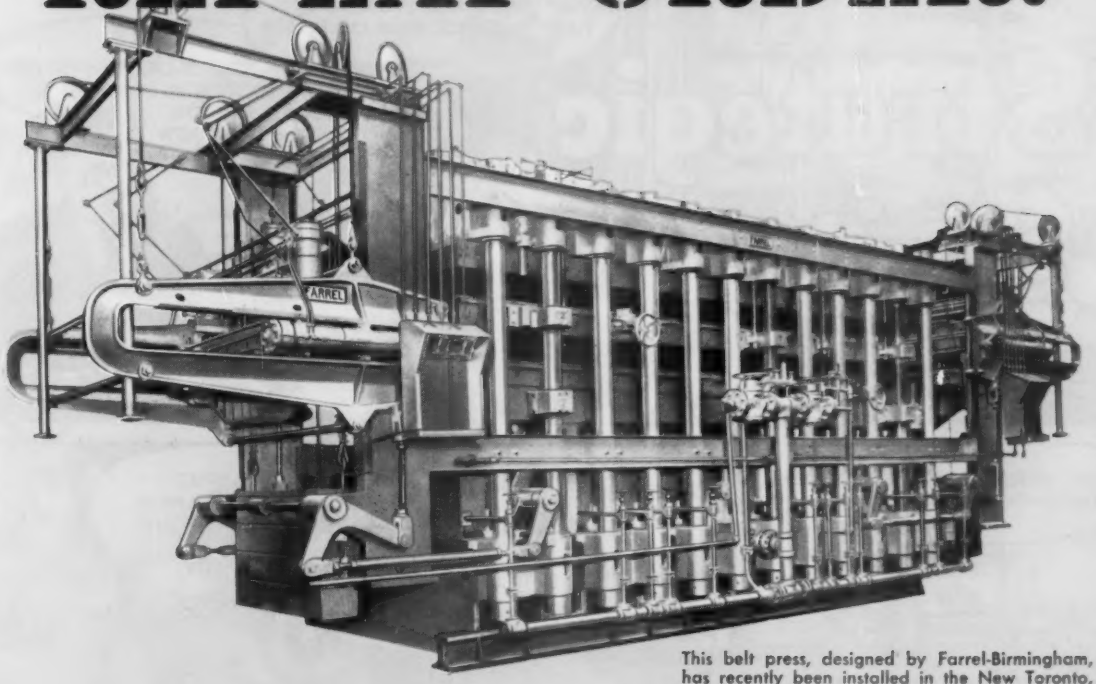

This belt press, designed by Farrel-Birmingham, has recently been installed in the New Toronto, Ontario, plant of Goodyear Tire & Rubber Company of Canada, Ltd.

Goodyear buys another giant belt press from Farrel

The world's largest capacity belt press, built by Farrel-Birmingham, was installed in 1952 at Goodyear Tire and Rubber Company's Akron plant. Capable of vulcanizing conveyor belts 72 inches wide, it has three platens of Meehanite® metal, 84 inches wide by 41 feet long.

Now, Goodyear has just installed another similar press in its New Toronto, Ontario plant. The new press is nearly identical, but with platens 31 feet long. It was designed by Farrel-Birmingham and built by their Canadian associate—The John Bertram & Sons Company, Limited, of Dundas, Ontario.

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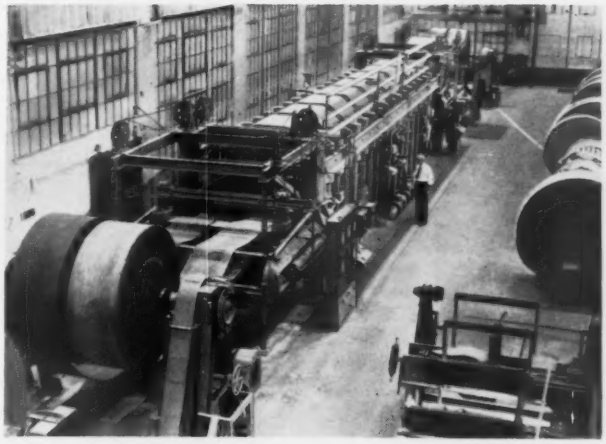

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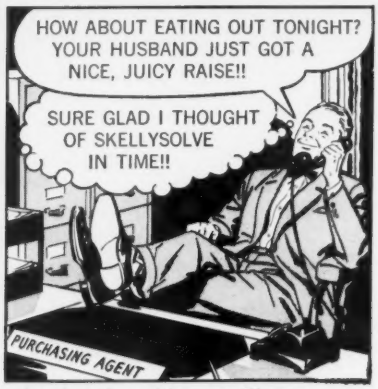
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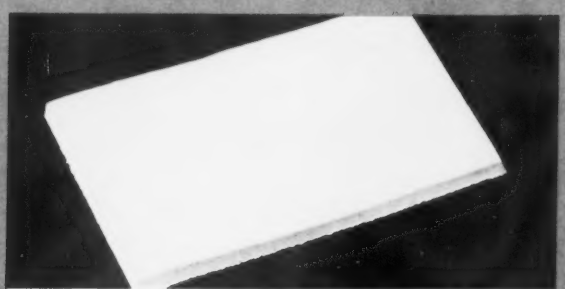

In this unexposed sample containing 37.5 parts of Circosol NS, there's still no sign of stain.

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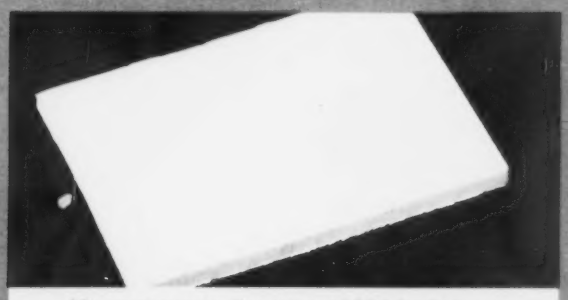

After exposure to ultraviolet at 150 F for 24 hours, this oil-free vulcanizate shows very little stain.

This sample with 37.5 parts of Circosol NS looks virtually the same as sample with no oil at all!

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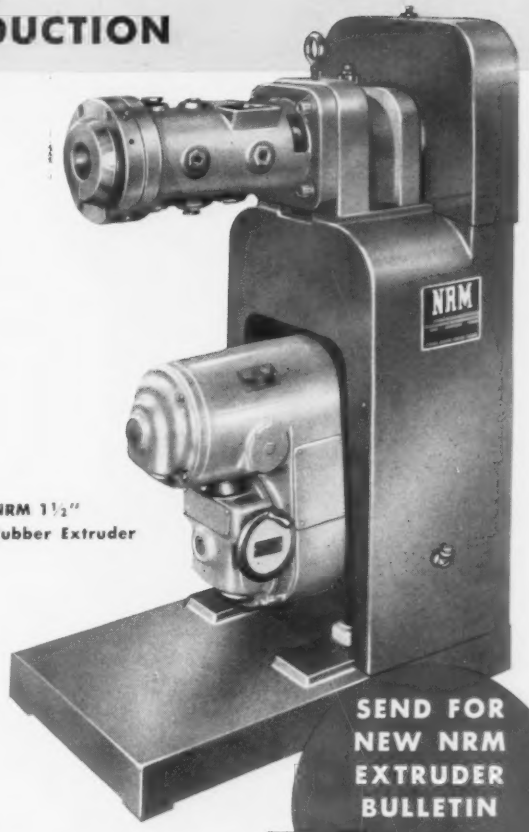

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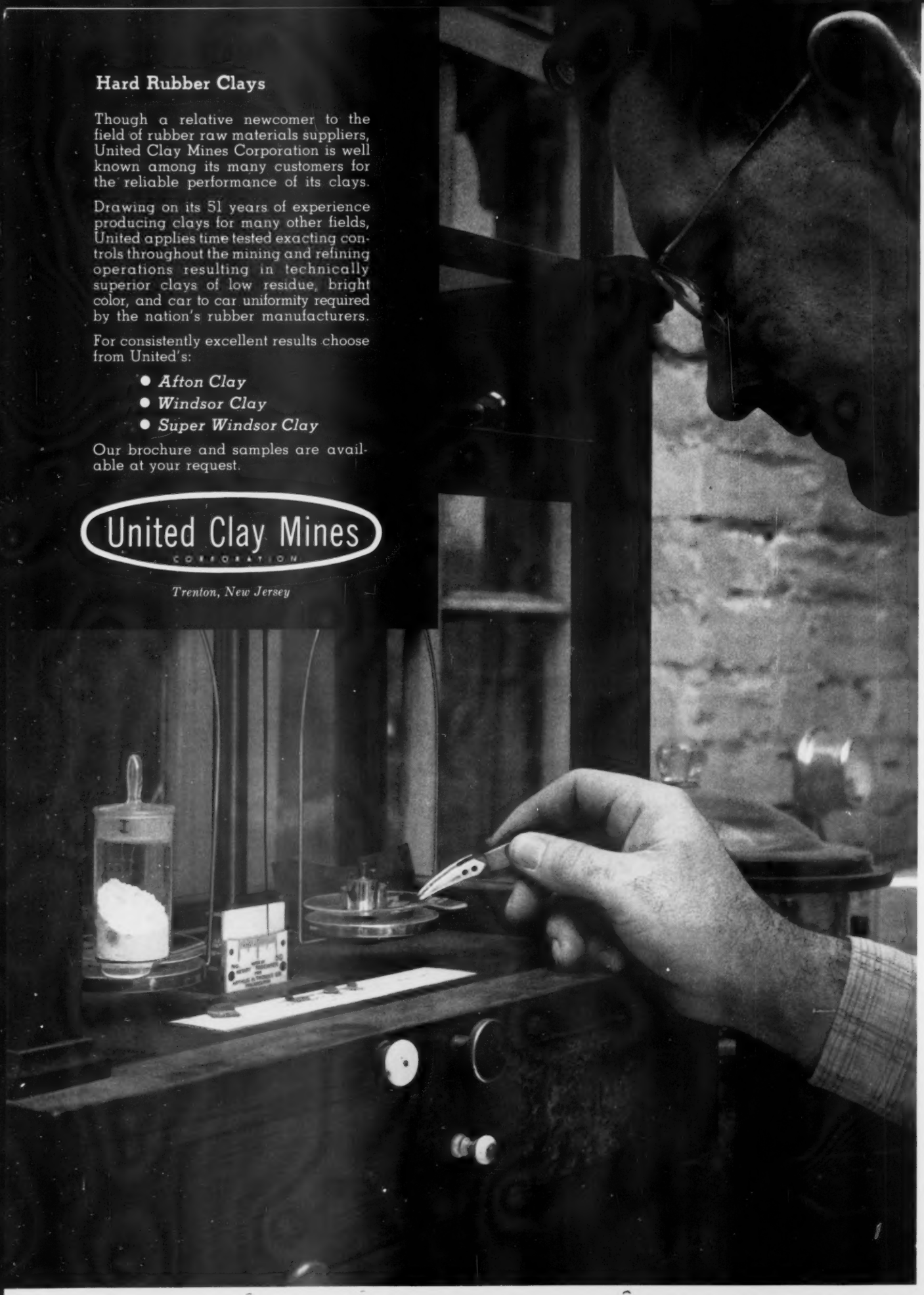

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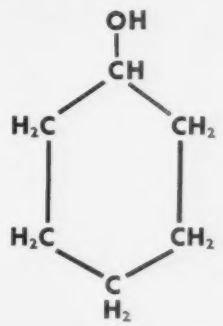

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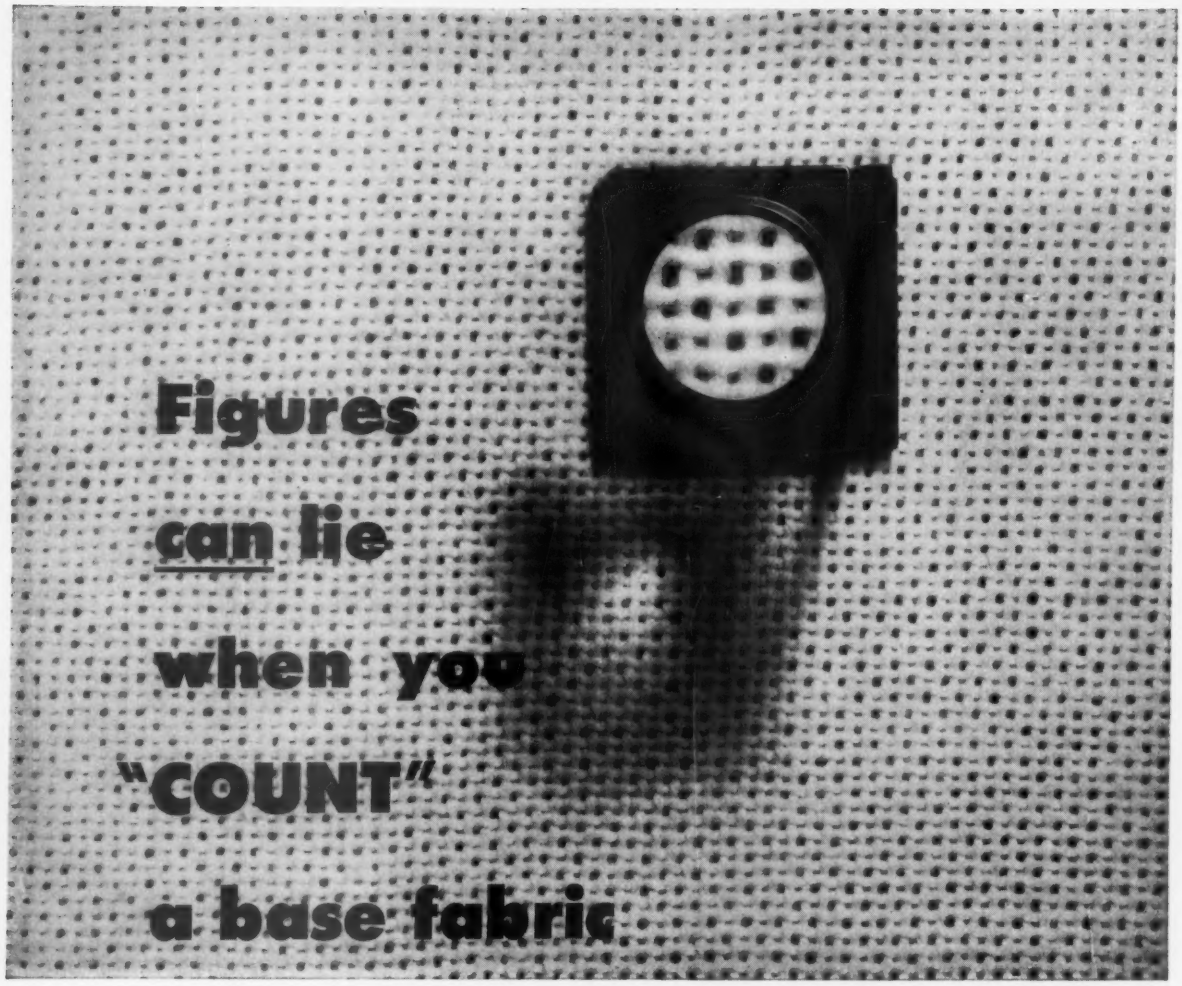

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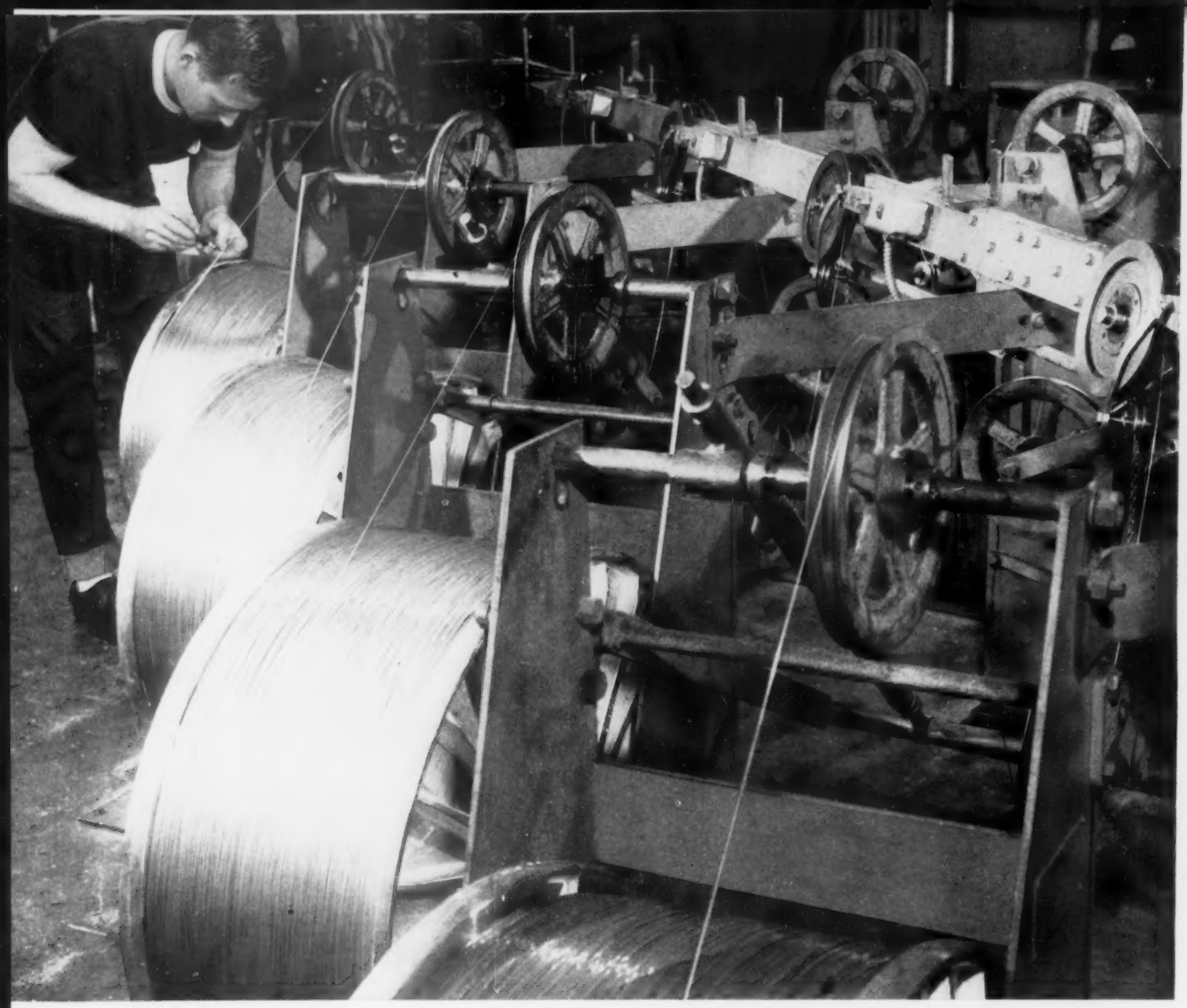


Let-off equipment at Gates Rubber is where Johnson Steel & Wire Company's tire bead wire proves out. Johnson's 1,000-pound coils give far longer runs than the former coils of 400 to 600 pounds. And Johnson's uniform quality and packaging techniques insure trouble-free operation.

Gates Cuts Tare Weights by 7½ Times With Johnson's New Bead Wire Spool

A unique history of success—founded on an unusual business philosophy—has been written during 47 years of business by The Gates Rubber Company of Denver.

From its beginning as a small leather shop in 1911, employing a single person, until the present when it is exceeded in size by only five other rubber manufacturers among 1,400 in the industry, Gates has restricted its production to what it calls "necessary accessories to an essential product."

Following this policy, Gates today is a leading supplier of industrial rubber products, one of the largest producers of hose, the world's largest manufacturer of V-Belts, as well as a growing producer of tread rubber and top quality truck and passenger car tires.

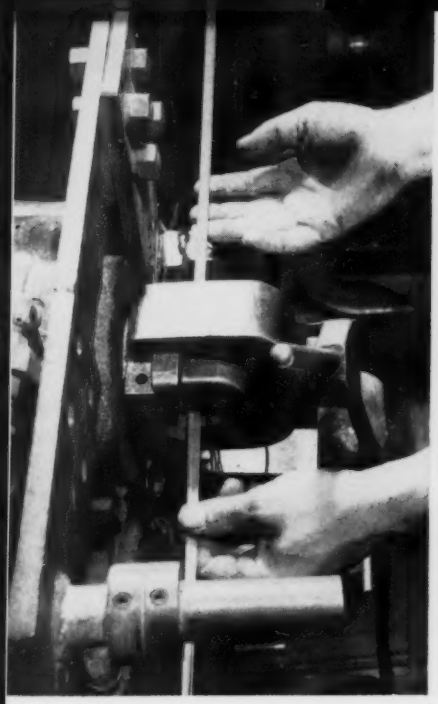
In tire manufacturing, as in its production of other products, Gates follows this three-fold quality "code."

1. Get the latest, most efficient tire-making equipment and operate it in a clean, modern plant.
2. Insist on finest raw materials.
3. Establish rigid specifications—test to make sure specs are met—inspect products in process frequently to be certain of desired final quality.

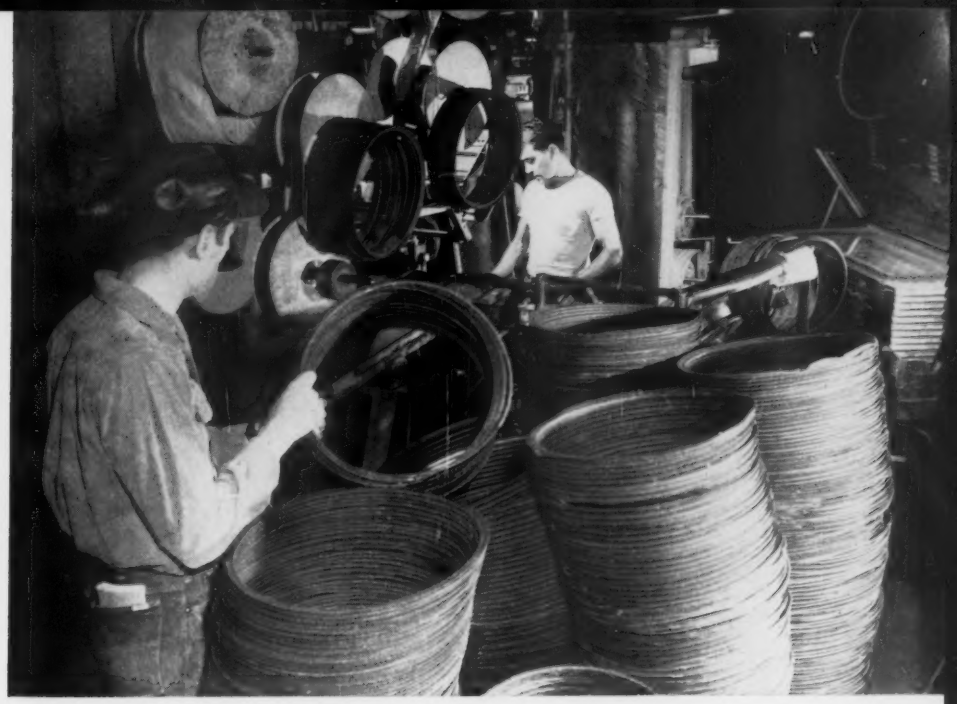
It's on points 2 and 3 that Johnson Steel & Wire Company, Inc., comes into the Gates picture.

Johnson's tire bead wire meets all requirements of Gates' four major specifications: uniformity of tensile, gage, plating as well as cast.

Then—in meeting Gates' fifth specification (for packaging), Johnson goes a step further and ships its tire bead wire on the finest new spool-less core available in the bead wire industry.



Here the actual beads are formed. Thick, uniform bronze coatings on tire bead wire, plus required composition, result in perfectly formed, evenly spaced beads that are tightly adhesive.



Where tires get muscles. Tire beads, each made of miles of Johnson Steel's tire bead wire, are shown here ready for delivery to the tire builder.

In transit, the protection Johnson's new spool-less core gives bead wire is important, but equally so is another factor—savings in freight costs.

Gates is extra sensitive to shipping costs. By drastically reducing tare weight on reels of wire being shipped to Gates, and by fully eliminating return of empty reels, Johnson cuts tare weight to two pounds per hundredweight.

Easily palletized for quick fork-truck handling, Johnson's bead wire on spool-less cores represents 7 to 7½ times less tare weight than old-style reels. Since there's no return of the flangeless cardboard cores, this expense is out entirely.

Once in the Gates plant, spool-less cores require less storage space. There is nearly 1,000 pounds of wire per coil.

The clean, unbroken surface of Johnson's tire bead wire, the required composition of the bronze plating on the correctly tensiled wire all mean that the miles of wire in a Gates bead will do the job it's designed for: giving strength equal to the overall quality of the tire.

The same assurance of quality wire and the latest in packaging technology that Gates gets are available from Johnson Steel no matter what your specialty wire needs.

Whether it's wire for brushes, aircraft, bobby pins, high-strength springs, textile cards, reinforced rubber hoses or tires—you can depend on Johnson. Call any of the sales offices listed here.

On Bag-o-matic machines like these, tires are shaped and cured. The Gates' battery of Bag-o-matics is one of the industry's largest and most modern.

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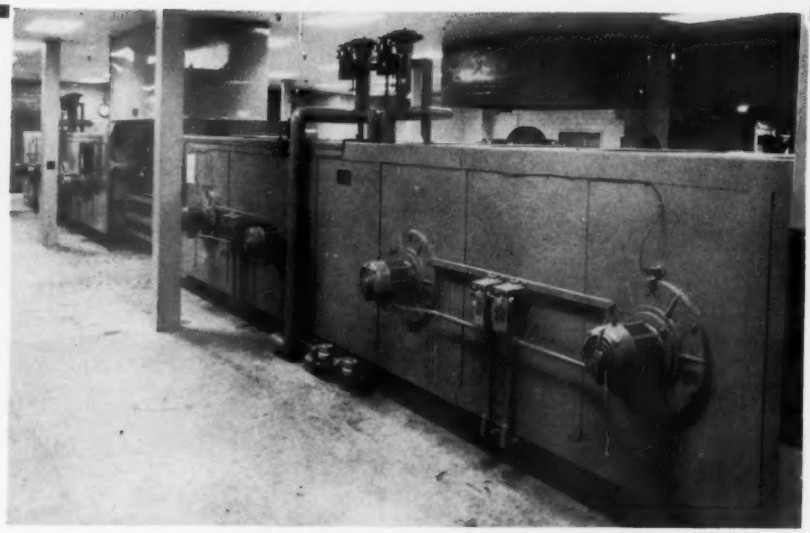

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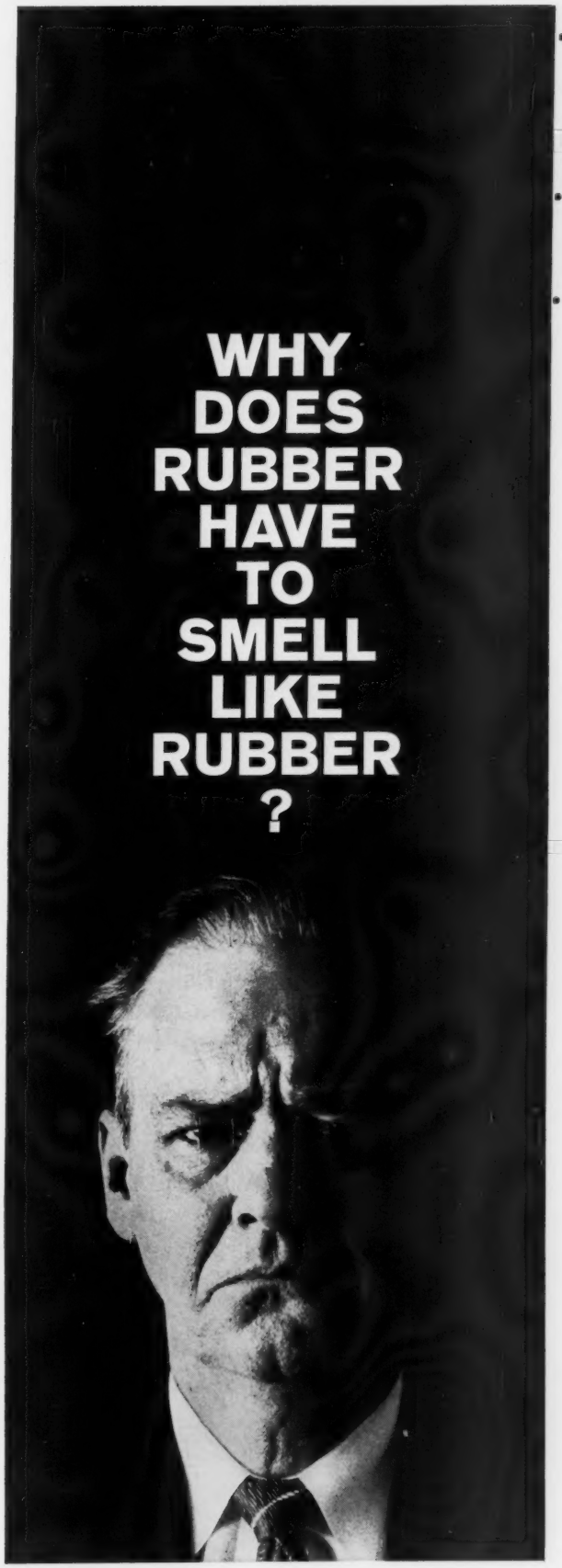

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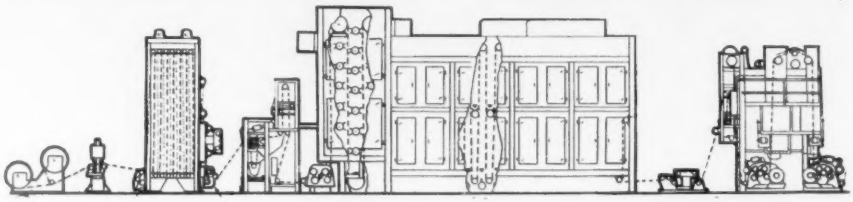

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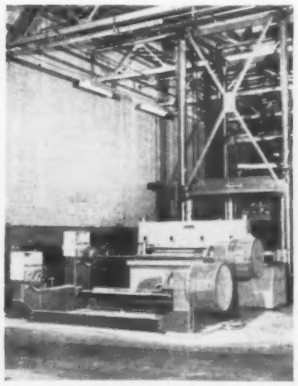

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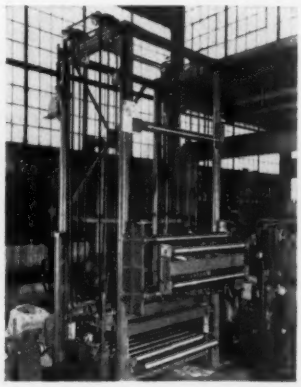

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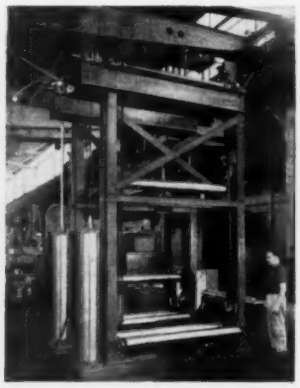

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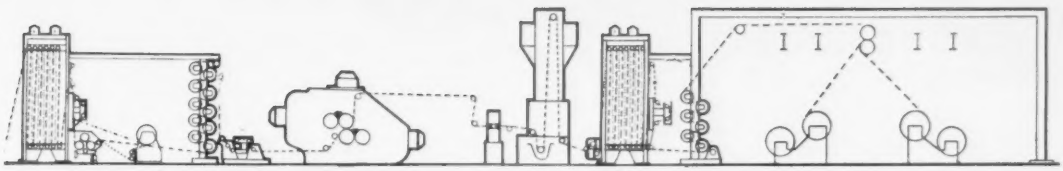

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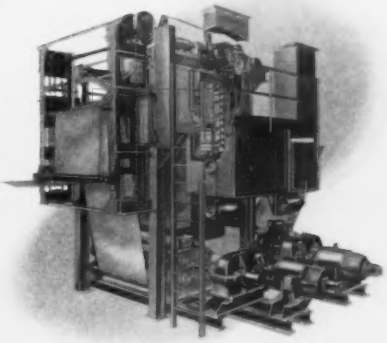

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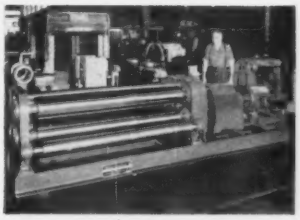

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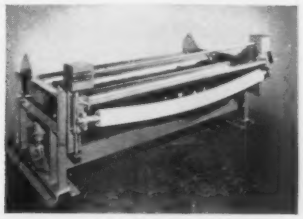

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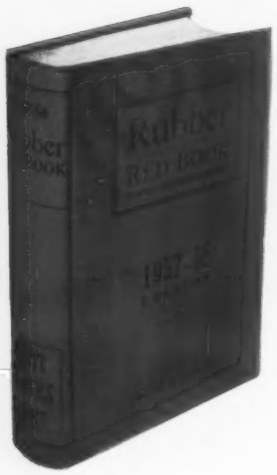

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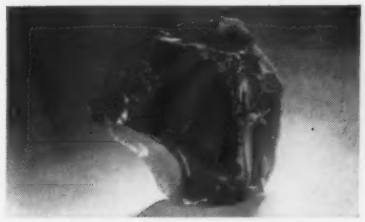

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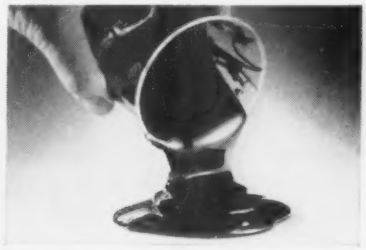

13037 liquid resin • This is the same basic type of resin as 12686, but in heavy liquid resin form. It can be used with other resins to obtain further softening of the stock during compounding without strongly affecting other properties. Alone, it does not contribute as much hardness and reinforcement to nitrile rubber stocks as do 12687 or 11504 resins. It requires addition of 10% hexamethylenetetramine to make it properly thermosetting.

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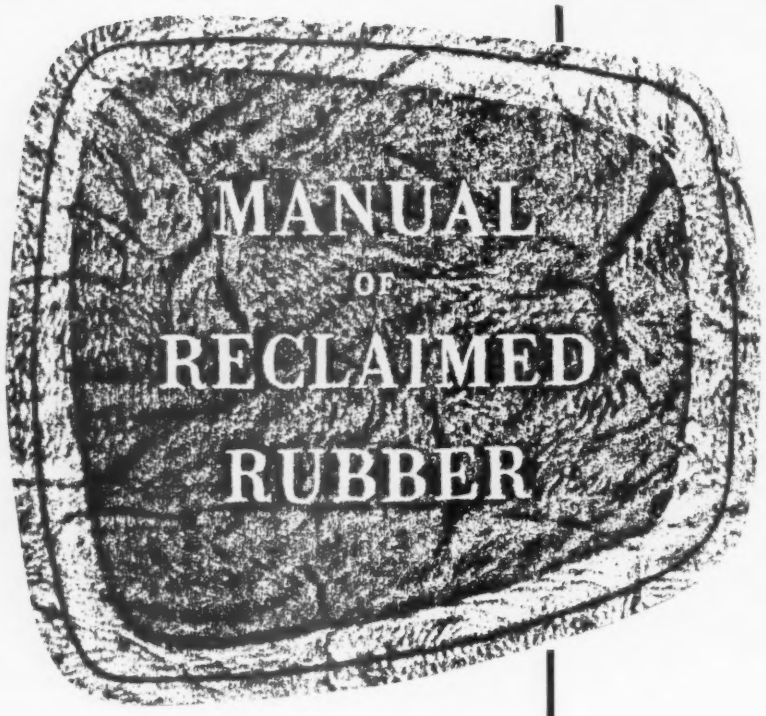

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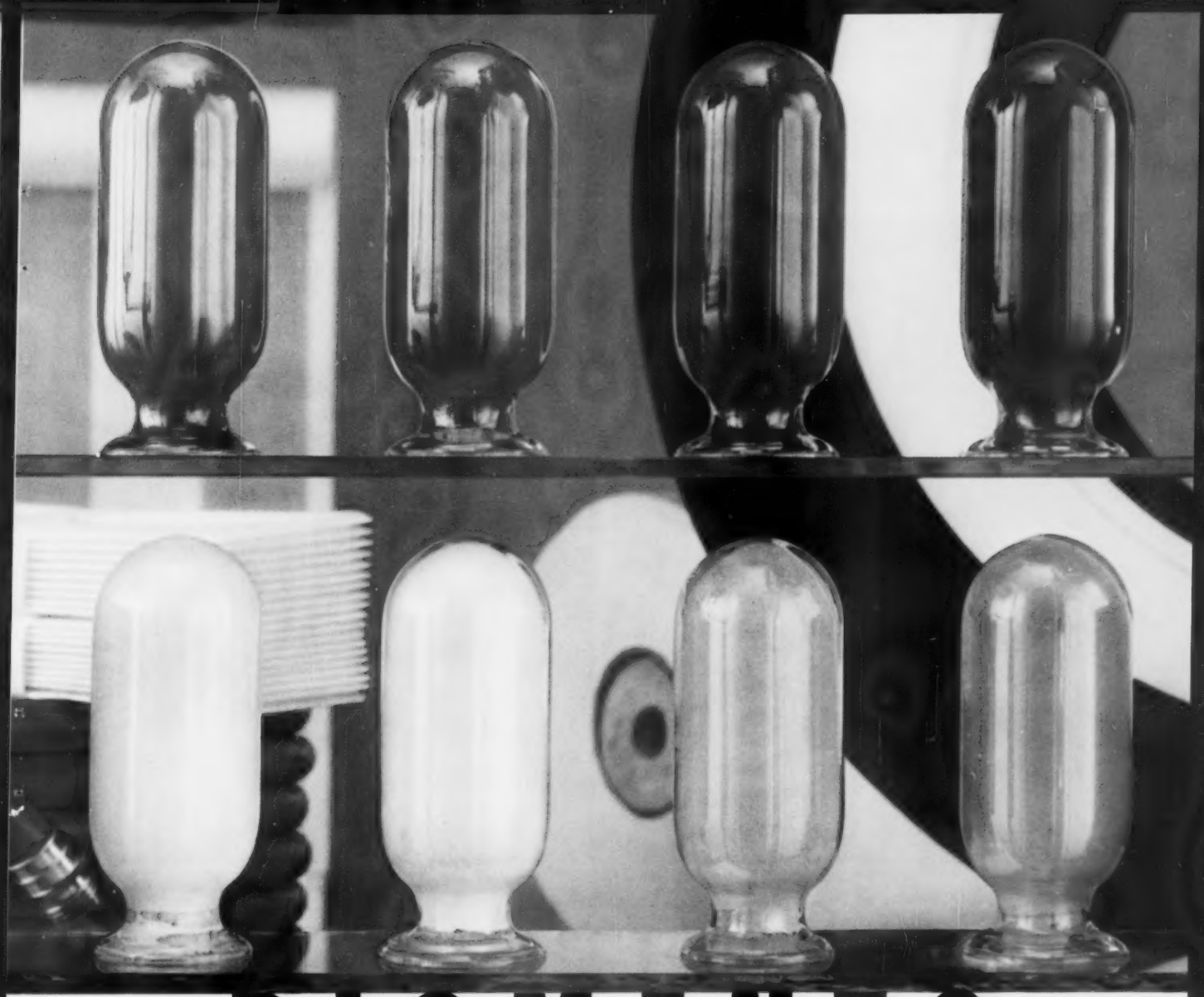

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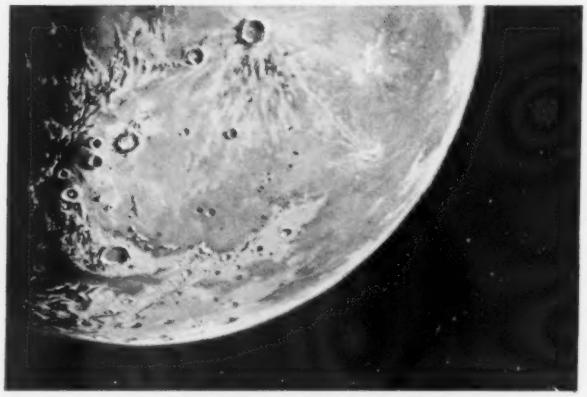

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Rubber Age

Vol. 82, No. 5 February, 1958

Radiation Curing of Silicone Rubber

- Sources of energy
- Chemical reactions of the polymer
- Advantages, including improved age resistance
- Modification of silicones

By L. M. EPSTEIN and N. S. MARANS*

Radiation & Nucleonics Laboratory, Materials Engineering Departments, Westinghouse Electric Corp., East Pittsburgh, Penna.

SILICONES are noted for their outstanding thermal stability in comparison with other elastomers. Cross-linking of these materials by peroxide curing agents requires high temperatures and long curing times and may leave undesirable residual products. It has been found, however, that the dimethyl silicones may be cured rapidly at low temperatures by high energy radiation without the introduction of any foreign materials. We begin our discussion with some general remarks concerning radiation processing.

Radiation Sources

Radiation sources that have been used to demonstrate the curing of polymers are nuclear reactors, particle accelerators and radioactive isotopes. Materials placed within nuclear reactors are exposed to fast and slow neutrons, electrons (beta particles), and gamma rays. The nuclear reactor is one of the least convenient ways of obtaining radiation processing. Measurement of the radiant energy absorbed and control of the temperature present difficulties. In addition, the sample and its container may become radioactive, depending on their composition, particularly trace impurities.

On the other hand, particle accelerators may conveniently be used for radiation processing. Particle accelerators may be adapted to the production of electrons, protons, deuterons, and other rays and particles, but for radiation processing an electron beam is used exclusively both for the sake of the high flux and for the penetration obtainable.

Radioactive sources for radiation processing include cobalt 60 (which emits gamma-rays), other processed isotopes produced in nuclear reactors (soon to be available commercially), and spent fuel elements from nuclear reactors. Most of the work on radiation processing of polymers has been done either with electron accelerators (resonant transformers or Van de Graaff machines) or with cobalt 60. The former may be characterized by high dose rates and moderate penetration and the latter usually by low dose rates and deep penetration.

It has frequently been stated that the nature of the chemical changes produced in an organic material are independent of the type of radiation. This seems reasonable when one considers that the energies of the radiant particles are of the order of a million electron volts, whereas the energy required to ionize an organic molecule is of the order of ten electron volts. Consequently, the number of primary interactions is negligible compared to the number of activated molecules formed by secondary processes. The ultimate fate of the material depends on how the activated molecules dissipate their

* Present address: Grace Chemical Research & Development Co., 3 Hanover Square, New York 4, N. Y.

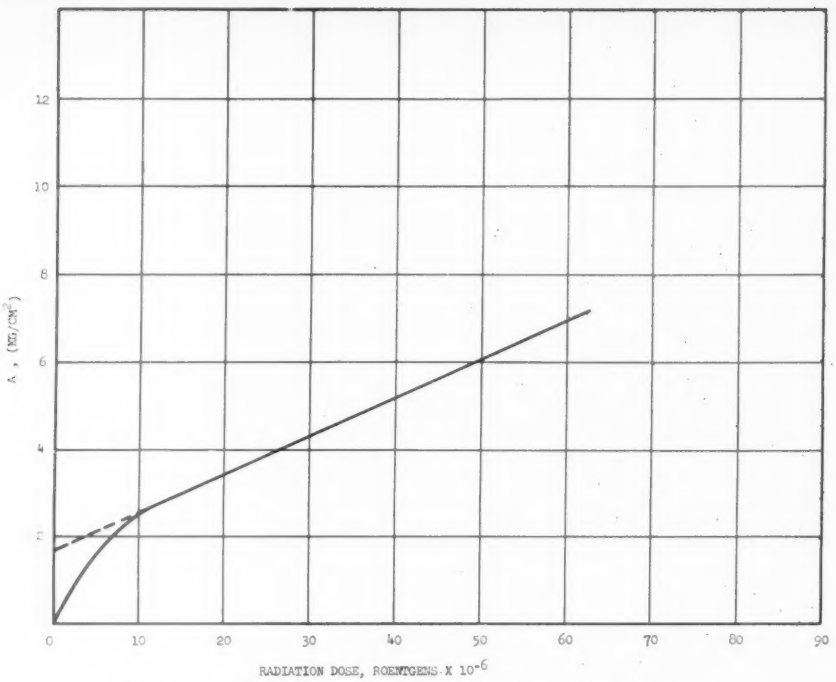


FIG. 1—Dependence of the normalized tension, A, on the radiation dose.

energy, and in particular on the reactions undergone by the free radical fragments into which the energized molecules may split.

While results with different radiations are qualitatively alike, the quantitive comparsion is uncertain because of dosimetry differences. For example, the radiation flux within a reactor is frequently measured by the activation of a suitable element by the slow neutrons plus a knowledge of the ratios of other radiations to the slow neutrons. For an electron accelerator the total beam power may be determined from its voltage and current, and the spatial distribution obtained from some chemical effect such as the bleaching of blue cellophane *(1)*.

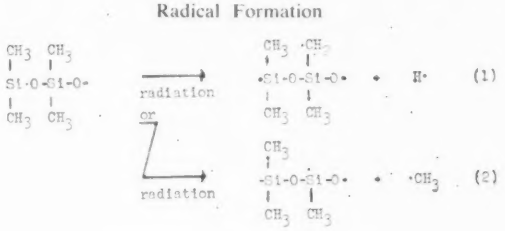
For a first approximation it may be assumed that radiation effects on organic materials are the same in quantity as well as quality for both gamma-ray and electron radiation. However, it must be remembered that in many cases radiation effects are dependent on dose rates, and that large differences in yield may be obtained for electron and gamma sources for this reason alone.

General Reactions

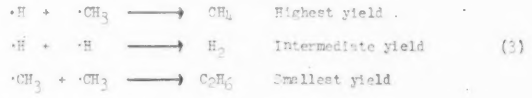
The radiation vulcanization of silicones has been approached both with the objective of its contribution to general polymer theory and for its practical significance. Charlesby *(2)* and Bueche *(3)* have been active in the theoretical field of radiation vulcanization of silicones. Westinghouse, General Electric, and Dow-Corning have reported success in the practical application of radiation vulcanization to silicones.

Vulcanization of silicones is postulated to occur by a free radical process, the methyl groups being subject to attack by fragments of peroxide vulcanizing agents or by high energy radiation. Analysis of the gaseous products of radiation cross-linking indicates that both hydrogen atoms and methyl radicals are formed and react with each other to give hydrogen, methane and ethane. The free radical sites on the chains likewise combine with each other to give cross-links. The relative proportions of the gases indicate preferential cleavage of the Si-C bond as compared to the C-H bond. The reactions that occur may be written as shown below:

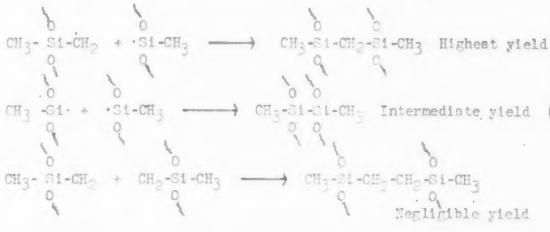
Radical Formation



Formation of Gaseous Products



Formation of Cross-links



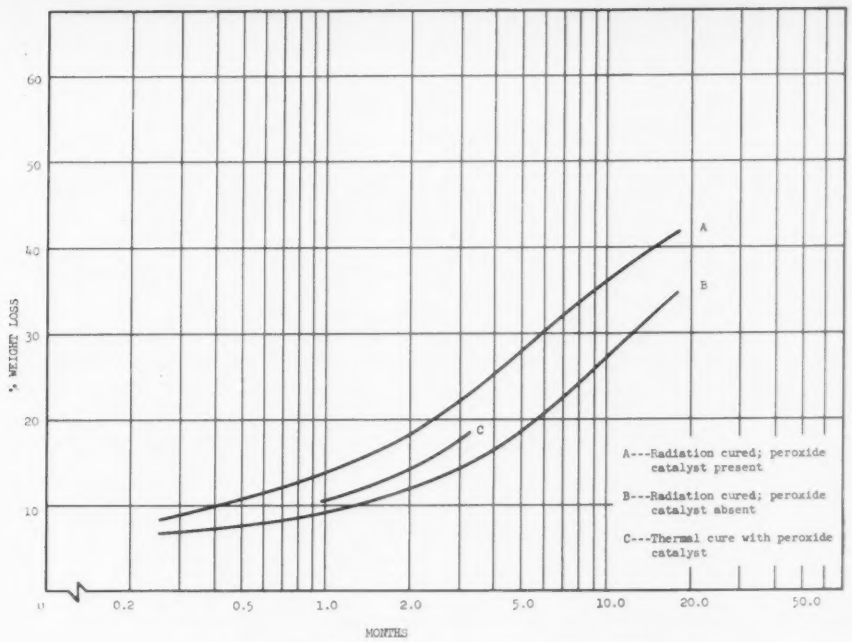


FIG. 2—Silicone rubber weight loss on aging in air at 250° C.

An alternative mechanism for the formation of hydrogen and methane is that methyl radicals or hydrogen atoms abstract hydrogen atoms from the chain.

The chemical vulcanization can be postulated to occur in the same fashion. On the other hand, the chemical vulcanization of the methylvinyl-silicones probably occurs through a normal vinyl addition process in the presence of peroxide fragments.

Application to Rubber Elasticity Theory

Silicones are in several ways ideal materials for experimental testing of the theories of rubber elasticity. First, the radiation cross-linking of silicones is relatively uncomplicated by side reactions, notably chain scission or oxidation. Second, silicones with high molecular weights are readily obtainable. Third, the silicones have very little viscoelastic character and reach stress-strain equilibrium rapidly at room temperature. Fourth, the mechanical behavior is not complicated by crystallinity.

Radiation cross-linking provides a means of introducing a controlled and accurately determined number of cross-links into a specimen. The technique, which is described by Bueche *(3)*, requires first the determination of the radiation cross-linking efficiency for silicones using a polymer of the same composition but much lower molecular weight (i.e., 6-12 dimethylsilicone groups per molecule). Such oils will not gel on moderate irradiation and the number of cross-links introduced by the radiation can be determined by cryoscopic molecular weight measurements. The "G" value for the process was found to be 4.5 cross-links per 100 electron volts of radiant energy adsorbed. It was presumed that this value applied as well to the high molecular weight silicone elastomers.

Individual specimens were found to exhibit rubbery elasticity.

$$\tau/(\alpha - 1/\alpha^2) = A \qquad (5)$$

where τ is the stress per unit undeformed cross-sectional area, α is the extension ratio, and A is called the normalized tension. At a given temperature A is a constant which should be proportional to the radiation dose at high doses.

Figure 1 shows the results obtained by Bueche. The term A is seen to be linear with dose at higher dosages. From the slope of the line and from the G value for cross-linking, it was calculated that the tensile modulus was only one-half the value predicted by the theory of Flory *(5)*, but in agreement with the theory of James and Guth *(6)*. Another feature of Figure 1 is the large positive intercept of the extrapolated line on the tension axis which was attributed by Bueche to permanent entrapment of entanglements.

Figure 1 can also serve as a guide to choosing the proper radiation dose for any desired degree of cure. The 100% modulus for the unfilled elastomers, in psi, can be obtained for any dose by multiplying A by the factor 24.9.

Advantages of Radiation Curing

On the practical side, the advantages of radiation curing of dimethylsilicones over that of conventional chemical curing are: (1) the absence of catalyst residues in the vulcanized product, (2) rapid curing, (3) curing at low temperatures without the necessity of a post-cure, (4) good control of the extent of cure, (5) elimination of the need for chemical introduction of vinyl or other groups to aid the cure and (6) little or no interference due to pigments, fillers, antioxidants and other ingredients.

Catalyst Residues. The absence of catalyst residues leads to better electrical properties and better oxidative and thermal stability. In addition, the absence of volatile residues guards against void formation in the rubber and environmental attack. Acid residues are particularly

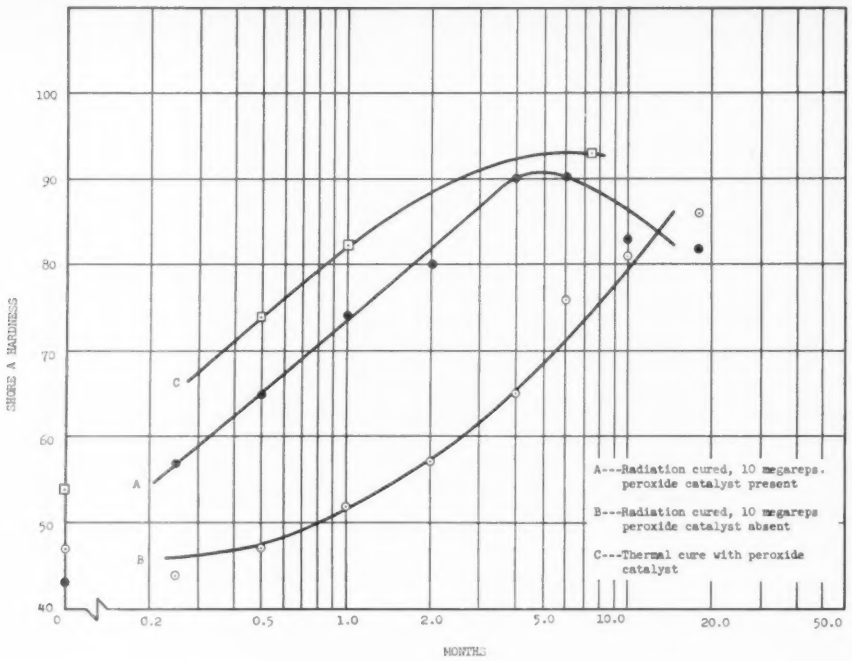


FIG. 3—Hardness of silicone rubber on aging in air at 250°C.

to be avoided since they could catalyze main chain breakdown.

The role of catalyst residues in initiating main chain scissions was shown by the stress relaxation work of Osthoff, Bueche, and Grubb *(8)*. Up to 130°C. there was no stress relaxation of the electron cross-linked gums in a nitrogen atmosphere, even in the presence of water vapor which greatly accelerated the relaxation of the peroxide cured samples. In addition the activation energy for the relaxation (when temperatures were raised as high as 260°C.) was 22.8 kcal. mole^{-1} compared to only 5.1 kcal. mole^{-1} for samples containing catalyst residues.

Rapid Curing of Silicones. The fastest means of curing dimethyl silicones is by the electron beam, the controlling factor being the rate at which heat can be dissipated from the specimens. Conventionally, the samples are passed back and forth beneath the beam (~ 20 in./min.) accumulating the total dosage a little at a time and allowing the material to cool most of the time. About one to two megarads can safely be accumulated in an organic plastic during each pass. (A megarad is 10^6 ergs of energy absorbed per gram. A rad is about 20% greater than a roentgen for air.) Since 10 to 15 megarads is a technically useful dosage, about 10 passes are required. This amount can be achieved for a single 6 x 6 inch specimen in less than ten minutes, using forced air cooling.

Ordinarily, catalyzed samples, after ten minutes or more in the mold, are post-cured in an oven for 24 hours at 250°C. For the irradiation of a large number of specimens, or continuous shapes, it might be more economical and convenient to accumulate the dosage more slowly, but the total rate of production depends ultimately on the power delivered by the electron machine. For example, a 3000 watt Van de Graaff machine, a practical size, could deliver ten megarads to a maximum of 240 pounds of rubber per hour.

Low Temperature Cure. The room temperature radiation cures are full cures as shown by the low compression set values. Warrick *(7)* found that over a wide range of dosages, the compression set at 150°C. averaged about 25%, compared to 100% for a peroxide cured sample of the same polymer.

Good Control of Extent of Cure. The radiation cure is quite free from side reactions and gives a highly reproducible yield of cross-links per unit dose. Peroxides, on the other hand, generally are used in large excess because they function at poor efficiency. They undergo induced decompositions, are very sensitive to other constituents present, and their rates of decomposition are very sensitive to temperature.

Radiation Cross-linking Compared to Vinylsilicone Chemical Curing. Radiation is not the only solution to problems in silicone rubber technology. In an effort to improve the control of the cure and reduce the time and temperature of cure by chemical means, vinyl groups have been introduced into the dimethyl silicone gums. This involves an additional expensive step in the synthesis of the dimethyl silicones. The cured products still suffer from the effects of catalyst residues, although this is mitigated by the fact that less catalyst is required.

Curing in the Presence of Fillers. Conventional curing procedures have been unsuccessful in the presence of some fillers, notably carbon blacks. Warrick *(7)* prepared a series of four compounds for electron irradiation containing respectively Degussa silica, Silica 1000 VFK, Micronex Beads EPC and Graphon, using 35 parts by weight of silica or 50 parts by weight of carbon black. The extent of cure from 6 to 20 megaroentgens was

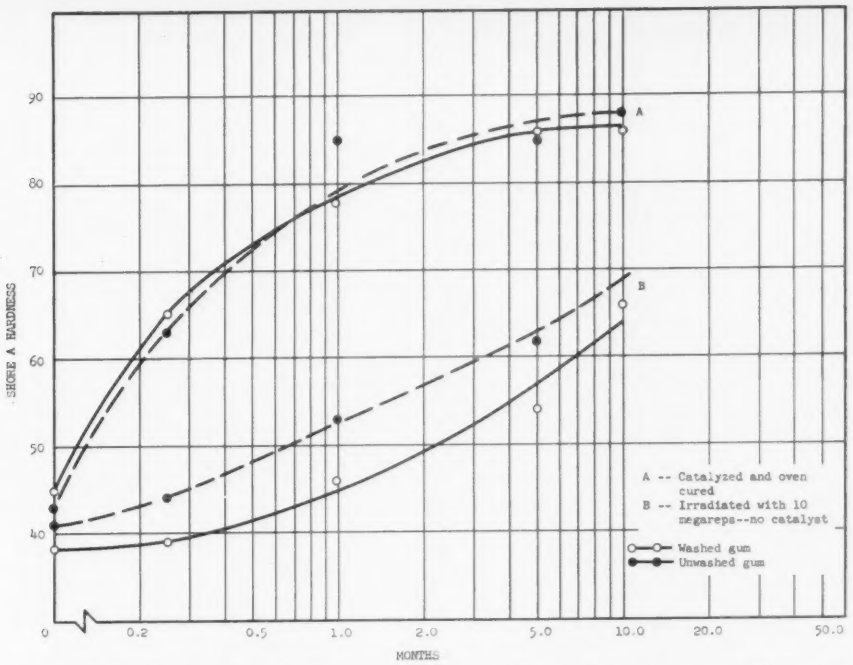


FIG. 4—Hardness of a catalyzed oven-cured silicone rubber and a radiation-cured silicone rubber with no catalyst on aging in air at 250°C.

nearly the same for all fillers as indicated by hardness and tensile modulus measurements. Unfortunately, after 24 hours at 250°C. the carbon black filled specimens became much harder and stiffer. This same effect had been noted with other black filled samples that were cured (albeit with difficulty) chemically. It had been hoped that radiation curing might have eliminated this condition.

Aging Studies

Filled silicone rubber compounds cured by radiation were compared to conventionally cured materials by E. J. Croop and C. Hofmann of Westinghouse Materials Engineering Departments. Their comprehensive studies (not yet published) demonstrated the superior long term aging properties of the catalyst free systems.

In Figure 2 the loss in weight in air at 250°C. is shown for periods of time from two weeks to eighteen months. Of the specimens which received the same irradiation, those which had benzoyl peroxide present lost weight more rapidly, as seen in curves A and B. Curve C, which shows the same result for conventional peroxide cured specimens, is lower than A, probably because of weight losses in curing. The weight loss was not a function of the radiation dose. Each point on lines A and C is the average of four doses from 3 to 16 megareps, with a relative average deviation at 18 months of ± 0.1%. (One megarep is about 0.93 megarad.)

Figure 3 shows the changes in hardness for the same set of specimens. Oxidative cross-linking, which increases the hardness, occurred much sooner when peroxide or peroxide residues were present. For the sake of clarity, points are shown for only the 10 megarep specimens. Those receiving the greater dosage were initially harder and for the most part remained harder than those with the lesser dosage.

Other physical properties measured were elongation and tensile strength. Elongation changes were the inverse of the hardness changes, as expected. After one month, all the uncatalyzed specimens had between 90 and 110% elongation, whereas all those with catalyst, irradiated and otherwise, were between 30 and 40%. The tensile strengths of the uncatalyzed materials remained sensibly constant, showing but a slight increase on aging. Specimens with catalyst increased in tensile strength more rapidly up to six months, but then degraded and were poorer at 18 months than the uncatalyzed ones.

Comparative Studies

In a later series of experiments Croop and Hofmann compared catalyzed oven-cured samples with radiation-cured samples. Duplicate preparations were made using washed and unwashed gum. The aging was carried out at 200°C. and 225°C. as well as 250°C. Figure 4, taken from this work, shows the changes in hardness on aging at 250°C.

The difference between the catalyzed and uncatalyzed samples is the same as that shown in Figure 3. In addition, it is seen that the peroxide catalyst is much more deleterious than any residual polymerization catalyst in the unwashed gum. In this experiment irradiation provided the tool whereby the effect of washing was assessed independently of other deleterious constituents.

Samples which received six megareps (not shown) were initially softer, but followed a parallel course on aging. The data at 200° and 225°C. were likewise very similar. The results for tensile strength and elongation

supported the conclusion that stability to aging was more sensitive to peroxide catalyst residues than to polymerization catalyst residues.

Modification of Silicones

Besides the application of radiation to vulcanization of the silicones, radiation has been used to modify the properties of silicones or to polymerize silicone monomers. Some accomplishments in the field of modification of silicones have been (1) the grafting of various monomers to dimethylsilicones, (2) the polymerization and cross-linking of hexamethylcyclotrisiloxane, (3) the cross-linking of phenylmethylsilicones, and (4) the dimerization of octamethylcyclotetrasiloxane.

Grafting of Monomers to Silicones. The radiation grafting of monomers to silicones is accomplished for silicones as well as for other parent polymers by the following general methods: (a) the polymer is irradiated in the swollen state with the monomer used as the swelling agent, (b) the polymer is irradiated and then the irradiated polymer is added to the grafting monomer and (c) the polymer is contacted either during or after irradiation with the monomer in the gaseous phase.

When a mixture of polymer and vinyl monomer is irradiated, the chain radicals formed, as previously shown in equations (1) and (2), may act as initiating centers for the growth of vinyl polymer chains producing a graft copolymer. An undesirable side reaction is the homopolymerization of the monomer initiated by nonpolymeric radicals formed during radiation. This can be minimized by using a vinyl monomer such as styrene which forms radicals in relatively low yields during irradiation in the pure state. As expected, the presence of a vinyl monomer that reacts with the chain radicals sharply reduces the extent of the cross-linking reaction, so that under proper conditions the grafts obtained are plastic.

Workers at Brookhaven National Laboratory *(9)* have reported grafts of up to 33.7% of acrylonitrile to dimethylsilicone, producing copolymers of greatly increased oil resistance. For example, the increase in weight on swelling in toluene was reduced from 131% for the pure silicone to only 17% for the graft copolymer. These samples had all previously been vulcanized by the conventional peroxide method to such a point that the swelling was not influenced by the slight additional cross-linking that might have occurred during the radiation grafting. Unfortunately, these grafts were also much more viscoelastic than the original silicone rubber.

Radiation Polymerization of Hexamethylcyclotrisiloxane. An interesting radiation polymerization in the silicone system is that of hexamethylcyclotrisiloxane. This compound radiation polymerizes in the solid state to give a cross-linked dimethylsiloxane polymer *(10)*. The monomer appears unique in its ability to polymerize in the solid state while not polymerizing in the liquid state. Though a number of solid monomers have been polymerized by radiation, only in the case of hexamethylcyclotrisiloxane has the same monomer material failed to polymerize in the liquid state.

The actual polymer obtained from the hexamethylcyclotrisiloxane, however, has poor physical characteristics probably arising from the inhomogeneities at the original crystal boundaries. The over-all reaction consists of (a) opening of the ring to yield a long chain polydimethylsiloxane and (b) concurrent cross-linking. The cross-linking reactions are undoubtedly the same as discussed above and indeed it was found that the yields of gaseous products were very similar. The opening of the ring, however, which ordinarily proceeds via ionic catalysts, is unusual in radiation chemistry.

Radiation Curing of Phenylmethylsilicones. A recent paper by Probe *(11)* has described the cross-linking or curing of phenylmethylsilicones by radiation. The G yield for cross-linking of the dimethylsilicones, known to be 4.5, is reduced to about 0.8 in the phenylmethylsilicone system. This may be considered a manifestation of the general rule that phenyl groups in an organic molecule increase its ability to dissipate high energy radiation without bond rupture.

Radiation Dimerization of Octamethylcyclotetrasiloxane. An additional interesting radiation modification of the silicone system is that obtained on electron bombardment of octamethylcyclotetrasiloxane *(12)*. This cyclic tetramer couples to a bicyclic compound through the methyl groups by reactions similar to equations (1) and (3). The tetramer does not form a linear polymer by ring opening under irradiation, in contrast to the homologous cyclic trimer. The bicyclic compound of the tetramer remains in solution in the unmodified tetramer and acts as a cross-linking agent when the solution is polymerized by conventional chemical polymerization catalysts for the systems such as quaternary ammonium hydroxide compounds.

Summary

High energy radiation is a very effective means of rapidly producing free radical sites on dimethylsilicone molecules at room temperature. These free radical sites provide a clean and controlled method of vulcanizing, as well as forming graft copolymers. This method applies as well to phenylmethylsilicones, although the effectiveness of the radiation in this case is reduced.

ACKNOWLEDGEMENT

The authors are indebted to Messrs. Hofmann and Croop for the use of their data and helpful discussions.

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Thermal Diffusivity of Butyl Rubber and Its Compounds

Part 1: Determination of Diffusivity Coefficients

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Enjay Laboratories, Linden, N. J.

In the vulcanization of thin articles, such as inner tubes or tensile sheets, the time necessary for the heat to penetrate the rubber and bring the total mass to the desired temperature level does not vary significantly for different rubber stocks. For thick slabs of rubber, though, it is necessary to know the thermal diffusivity coefficient for the rubber. The time needed to heat the interior of the compound to the temperature level can be predicted by knowing this coefficient.

Thermal conductivity measurements have been made *(2)* for natural rubber and some of its compounding ingredients (zinc oxide, sulphur). The thermal conductivity of the compounded natural rubber has, in general, been found to be an additive function of the component conductivities. Previous investigations also indicated that cured and uncured portions of the same stock have the same heat conduction. Data on heat conduction in synthetic rubbers have been reported by Rehner *(4)* for butyl rubber, Perbunan, styrene rubber, polybutadiene, neoprene and polyisoprene pure gum stocks. Butyl rubber and Perbunan were also reported for loadings of Bardol and carbon black. The values for butyl rubber are listed in Table I.

The experimental method is based on the analysis of Williamson and Adams *(5)* for the heating of a sphere, which is initially at a uniform temperature, and is then immersed in a constant-temperature bath which holds the surface temperature constant. The equation set forth was:

$$\frac{T_i - T_c}{T_i - T_o} = 2\sum_{M=1}^{M=\infty} \frac{(-1)^{M+1}}{} \; e^{\frac{-KM^2\pi^2}{a^2}t} \qquad (1)$$

where, T_i = surface temperature,
T_c = temperature of the center of the sphere (varies with time),
T_o = temperature, initial uniform temperature of sphere,
a = radius of sphere,
t = time,
K = thermal diffusivity coefficient, and
M = integers from 1 to ∞.

Williamson and Adams further facilitated the use of this equation by plotting, $\frac{T_i - T_c}{T_i - T_o}$, (referred to as U_F, fractional temperature), versus Kt/a^2, for spheres, cylinders (infinite length), cylinders (length equal to diameter), square bars, cubes, and slabs. The plot for the sphere is used in this experiment to determine the values of K, while the other plots (e.g., the slab) can be utilized for transferring the experimental data to practical cases.

It must be realized that the equations developed by Williamson and Adams are for objects whose surfaces are considered to have an infinite film coefficient. Rehner

TABLE I — EFFECTS OF BARDOL AND CARBON BLACK (KOSMOBILE 66) ON THERMAL CONDUCTIVITY OF BUTYL RUBBER

Loading	Thermal Diffusivity $K \times 10^4$ (cm²/sec.) 140°F.	284°F.	$\frac{K}{T} \times 10^5$ $\frac{cm^2}{Sec.\ (°F.)}$
Pure Gum	0.89	0.51	0.26
100 parts Gum 20 parts Bardol	0.93	0.46	0.33
100 parts Gum 54 parts Carbon Black	1.34	0.65	0.48

* Present address: Tekn. Oorg. Kemi (KTH), Stockholm 70, Sweden. Note: This paper was presented before the Division of Rubber Chemistry, American Chemical Society, at Montreal, Quebec, Canada, May 16, 1957.

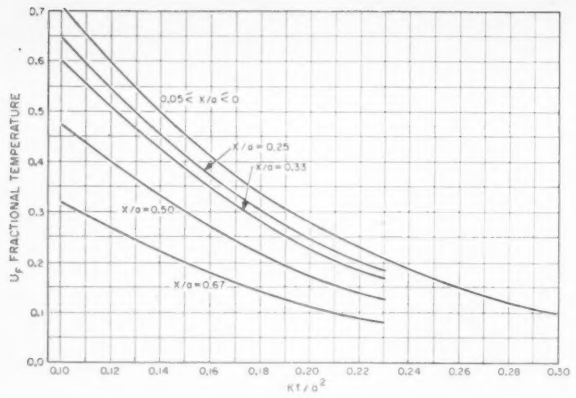

FIG. 1—Effect of asymmetry (U_F versus Kt/a^2).

(4) discussed this point in regard to work done by Frumkin and Dubinker using an air chamber as the constant temperature bath. The film coefficient between rubber surface and bath when silicone oil was used as a surrounding medium is discussed later in this paper.

Other investigators have considered the heating of objects with fluids having varying film conductivities *(1, 3)*. However, in our experiments film conductivity coefficients were assumed to be a function of the bath viscosity. All thermal diffusivity coefficients were corrected to zero bath viscosity which would refer to film coefficients of infinite conductivity.

Experimental Method and Techniques

The spheres were made by the vulcanization of rubber in a spherical cavity mold having a diameter of 2 inches. Each sphere was then frozen in a dry ice-isopropanol bath and cut with a band saw to a depth just past the center. The leads of a 28 B&S gage (approximately 10 MIL) Iron-Constantan thermocouple were introduced from diametrically opposite sides of the cut sphere and the thermocouple junction located at the center. The cut surfaces were then coated with a fast curing butyl cement. A wood prop (¼ inch long, broken from a match stick) was placed to separate the two surfaces. The ball was put in a 150°F. air oven to remove the volatile matter in the cement. The cut edges were then taped together and the ball clamped in a wooden spherical cavity mold. While clamped it was placed in an air oven at 300°F. for one hour to cure the cement, and then placed into a 160°F. air oven for ten hours for further curing. The balls were then allowed to come to a uniform temperature in an air conditioned room (75°F.). The surface of each ball was also rubbed with emery cloth to remove the "slick" skin and any foreign matter.

With the thermocouple leads attached to a Leads-Northrup Precision Potentiometer, the reference junction of the thermocouple being kept in an ice-water bath, the initial temperature of the sphere was measured. The time-temperature history of the center of the sphere was recorded after the ball was plunged into a beaker of heated and agitated silicone oil. The ball was kept stationary by a wire cage which centered it on a small copper ring. The leads of the thermocouple were immersed to a minimum depth, just sufficient to have the agitated silicone oil passing over the top of the ball. Typical runs lasted from 15 to 45 minutes depending on the temperature level of the bath and the particular specimen. The majority of readings were taken with the bath temperature at 265°F.

TABLE II — EFFECT OF TEMPERATURE OF SILICONE OIL BATH ON THERMAL DIFFUSIVITY COEFFICIENT (K)

T_1	T_c	T_∞	U_F	Kt/a^2	t (min.)	a (cm.)	K $cm^2/sec.$
265	244	75	0.11	0.288	20	2.5	1.50
267	244	75	0.12	0.280	20	2.5	1.46
266	244	75	0.115	0.284	20	2.5	1.48

Discussion of Experimental Method

Several portions of the experimental procedure deserve enlargement at this point to emphasize their significance in the determination of the thermal coefficients.

The balls were not cut into hemispheres but cut only partially through so that the tendency to become asymmetrical, when clamped, would be lessened. Introducing the thermocouple leads together at one point on the circumference was unsatisfactory. By X-raying the rubber spheres with imbedded thermocouples, it was found that the junction of the couple was off center, possibly due to movement of the cemented rubber surfaces. To correct this the freedom of movement was limited to a linear one by introducing the leads from opposite sides. Further X-rays indicated this method kept the junction at

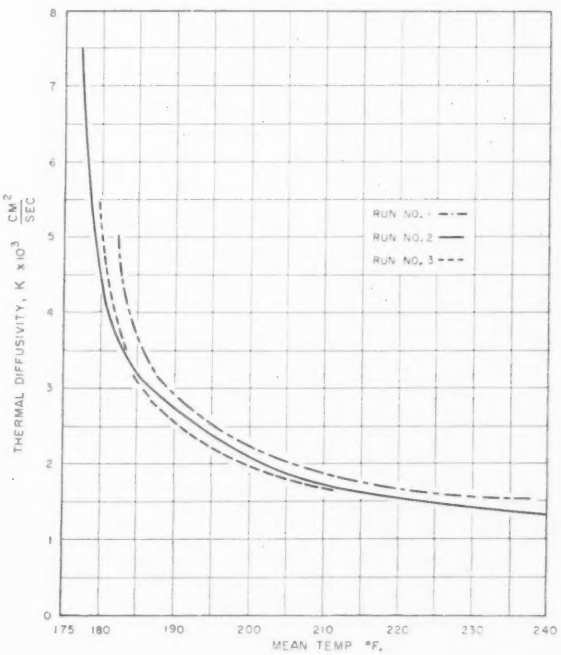

FIG. 2—Thermal diffusivity versus temperature (°F.) (Enjay Butyl 325, Kosmobile 66).

the center of the ball (at least within computational deviations). It should be mentioned that it is necessary to locate the junction with only 5 per cent accuracy at the center. The plots of U_F versus Kt/a^2 in Figure 1, as presented by Williamson and Adams, are essentially the same for

$$\frac{X}{a} = O \text{ and } \frac{X}{a} = 0.05.$$

The asymmetry of the sphere as a result of clamping the ball was within this 5 per cent limit.

The balls were placed in the 150° F. air oven to expel the volatile matter in the cement. Gas bubbles were observed issuing from the cut in the rubber sphere while in the oil bath when this precaution was not taken. The gas bubbles would, of course, affect the measured thermal diffusivity. The very fine thermocouple leads (0.010 inch) were used to obtain a small junction head and thus the temperature reading exactly at the center. They also reduced any effect that heat conduction along the thermocouple leads might have on the temperature of the junction. When leads of 0.033 inch were used, the initial values of K, $cm^2/sec.$ were approximately five times the equilibrium values finally reported.

The temperature of the silicone oil bath was constant to a value of ± 1°F. This variation occurred approximately every ¾-minute. The effect that this might have on the values of K is shown in Table II.

It can be seen from the table that the value of K for 266°F. is the same as the average value of K for the average of 265°F. and 267°F. The magnitude of this variation in K, of course, depends upon U_F, the K variation increasing with the decrease in U_F. The temperature variation was undoubtedly due to the temperature lag between the mercury switch and the bath fluid. Curves are plotted in Figure 2.

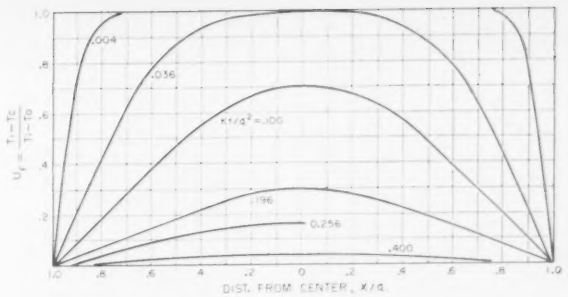

FIG. 3—Sudden cooling or warming of a sphere.

The thermal diffusivity coefficient was calculated from the time-temperature history of the center of the sphere by means of equation (1). As mentioned, the curves prepared by Williamson and Adams in Figure 1 facilitated the use of the equation. The values which they give for U_F versus Kt/a^2 were plotted and tables prepared (as part of this investigation) from the subsequent interpolation for values of U_F from 0.70 to 0.10. The preparation of tables prevented random interpolation variations and also facilitated the evaluation of the coefficients.

In reporting heat transfer coefficients, it is necessary to state them for definite mean temperatures rather than for temperature ranges. Rehner determined the average value, U_{AV}, of the fractional temperature, U_F, from the area under a set of curves of U_F versus x/a. X/a is the ratio of the distance from the center of the sphere to the radius, and the values of Kt/a^2 are parameters as shown in Figure 3. The resulting fractional mean temperature, U_{AV}, versus Kt/a^2, is used to plot K, thermal coefficient versus T_{AV}, the average temperature. As explained later, the values of K, determined using the silicone oil bath at 265°F., were modified to account for the surface contact film coefficient.

TABLE III — COMPOUNDS USED TO DETERMINE THERMAL DIFFUSIVITY COEFFICIENTS

BASE COMPOUND			
Enjay Butyl 215			100
Zinc Oxide			5
Sulfur			2
Tellurac			1
Carbon Blacks (added to base compound)			
Thermax	40	80	160
Philblack A	40	80	160
Philblack E	40	80	160
Sterling R	40	—	—
White Filler (added to base compound)			
Atomite	40	80	160
ENJAY BUTYL 215 GUM STOCK (Cure: 45 min. @ 300°F.)			
Enjay Butyl 215			100.0
Zinc Oxide			5.0
Sulfur			1.5
Tuads			1.0
ENJAY BUTYL B-10 GUM STOCK (Cure: 80 min. @ 320°F.)			
Enjay Butyl B-10 (1139-901)			100.0
Zinc Oxide			5.0
Sulfur			4.0
Tuads			1.5
PBN			0.5

Discussion of Results

Thermal diffusivity coefficients were determined for a loading series of carbon and white fillers, and for two dissimilar butyl polymers. The rubbers and the compounding recipes are given in Table III. The unsaturation of the Enjay Butyl 215 and Butyl B-10 are 1.5% and 4.9% respectively.

Figures 4 and 5 are plots of K, $cm^2/sec.$ versus T_{AV}, for carbon black and white filler stocks. The bath used was of silicone oil at a temperature of 265°F. These plots show that:

(1) The higher the loading of carbon black the higher is the thermal diffusivity coefficient for a specific temperature.

(2) The curves are linear and the slopes negative, K the coefficient decreases as temperature increases.

(3) The slope $\left(\frac{-\triangle K}{\triangle T}\right)$ is greater (in a negative direction) for the more highly loaded stocks.

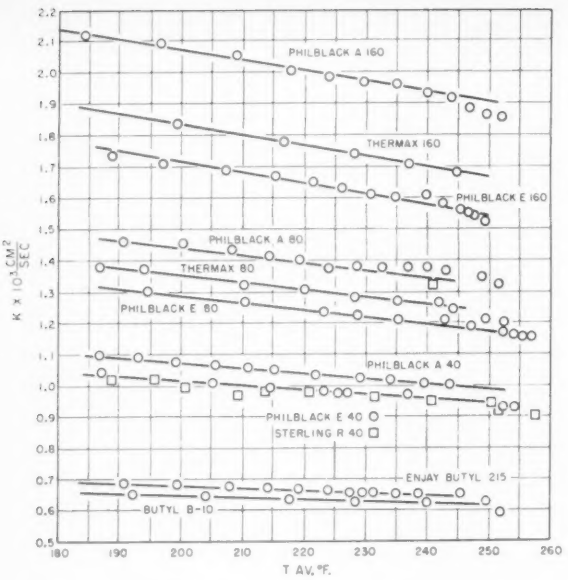

FIG. 4—Black fillers—thermal diffusivity (cm.²/sec.) versus mean temperature (°F.).

(4) The effect of particle size on the thermal coefficient cannot be stated for the data are not entirely consistent. The loadings at 160 parts of black show the Thermax to be between Philblack A and Philblack E in thermal diffusivity. The same relative positions are noted for the loadings at 80 parts of carbon black. The loading at 40 parts shows the Thermax to be below both the Philblack A and the Philblack E. None of these runs were verified except by using the same ball.

Figure 6 is a plot of K, cm²/sec. versus T_{AV} for the Thermax 80 ball. The parameters shown are a function of both the constant temperature bath temperature and the fluid used in the bath.

To expand the values of K to higher temperatures, a higher constant temperature (338°F.) was used. It was anticipated that the curves found by using the different temperature baths would fall on the same straight line. As can be seen from Figure 6, this was not so. In addition to the values varying as a function of the bath temperature, they also varied as a function of bath fluid.

Values obtained using silicone oil and using glycerol differed even though they were at the same temperature. A comparison of the position of lines in Figure 6 with the type and temperature of the bath indicated that a relation with the bath viscosity existed. The points for line 6, using the water bath, do not describe a straight line as well as do experiments in silicone oil and glycerol. The rubber sphere used in the water bath experiments had previously been used in silicone baths. This previous treatment might have affected the wetting of the surface and thus the conductivity of the film at the interface. A straight line, however, was drawn through the points of experiment 6 parallel to the general pattern of the other experiments.

These preliminary observations suggested that the observed thermal diffusivity constants were a combination of the constants for the rubber sphere and the constants for the interfacial films. The latter term would be

TABLE IV — EFFECT OF BATH VISCOSITY ON K_T VALUE AT 210°F.

Run	Bath	Temp. °F.	Visc. Centipoise	K_T (210°)	$1/K_T$
1	Silicone Oil	181	150	1.19×10^{-3}	840
2	Silicone Oil	214	100	1.283×10^{-3}	775
3	Silicone Oil	265	60	1.325×10^{-3}	756
4	Glycerol	179	30	1.338×10^{-3}	747
5	Silicone Oil	338	45	1.380×10^{-3}	725
6	Water	179	0.35	1.43×10^{-3}	700

dependent upon the viscosity of the bath fluid. The true value of K for the rubber was then obtained by the following method. It was assumed that the resistance to heat transfer was due to the sphere and to the contact film between the sphere and the fluid. Based on the assumption that the agitation of the baths was the same in all cases, the following equation was set forth:

$$\frac{1}{K_T} = \frac{1}{K_R} + C\mu \qquad (2)$$

where, K_T = thermal diffusivity coefficient measured for the sphere and the film (total coefficient),
K_R = thermal diffusivity coefficient for the rubber,
μ = viscosity of bath fluid, and
C = constant.

The viscosity of the bath fluids at the temperatures indicated in Figure 6 were determined with a Brookfield viscosimeter and listed in Table IV. These viscosity values when plotted as a function of $1/K_T$ describe a straight line whose intercept at $\mu = 0$ would be the reciprocal of the true diffusivity constant for the rubber as shown in Figure 7.

In Figure 7, $1/K_T$ versus μ was plotted for values of K_T at 210°F. As shown in Figure 6, some of the experimental lines have to be extrapolated to intersect with the vertical at 210°F. to obtain K_T at 210°F. In the above equation 2, $1/K_F = C$ where K_F = thermal diffusion constant for the film. This states that the higher the viscosity of the surrounding bath fluid the higher is the resistance of the film, or the lower is its conductivity.

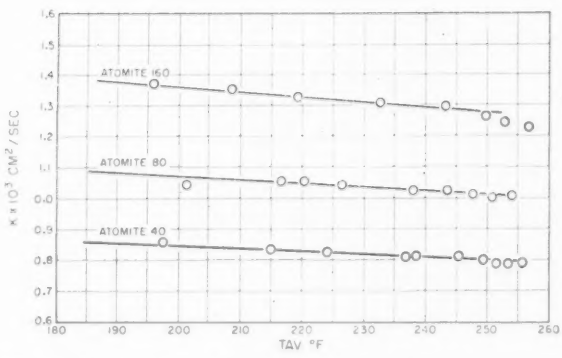

FIG. 5—Mineral fillers—thermal diffusivity (cm.²/sec.) versus mean temperature (°F.).

TABLE V — THERMAL DIFFUSIVITIES CORRECTED TO ZERO VISCOSITY OF BATH LIQUID

Compound (from Table III)	(1) K_T @ 210°F. Using Silicone Oil @ 268°F. = 60 Centipoise	(2) Correction Factor 1-0.96 $K_T \times 10^{-5}$	(3) $\Delta K_T/\Delta T$*	(4) K_R @ 210°F. in Cm.²/sec. (Equation 4)	(5) $\Delta K_R/\Delta T \times 10^{5}$** Cm²/sec./°F.	(6) Vol. Fraction of Filler
Philblack A—160 pts.	2.04	0.882	—0.34	2.31	—0.38	
Thermax—160 pts.	1.80	0.896	—0.34	2.01	—0.38	0.424
Philblack E—160 pts.	1.68	0.903	—0.34	1.81	—0.38	
Philblack A—80 pts.	1.42	0.918	—0.24	1.55	—0.26	
Thermax—80 pts.	1.33	0.923	—0.22	1.44	—0.24	0.266
Philblack E—80 pts.	1.27	0.927	—0.22	1.37	—0.24	
Philblack A—40 pts.	1.05	0.940	—0.16	1.12	—0.17	
Philblack E—40 pts.	1.00	0.942	—0.16	1.06	—0.17	0.153
Sterling R—40 pts.	1.00	——	——	——	——	——
Gum Stocks						
Enjay Butyl 215 (1.5%)% VI = 520	0.67	0.961	—0.07	0.70	—0.07	
Enjay Butyl B-10 (4.9%)% VI = 260	0.64	0.961	—0.07	0.67	—0.07	0
Atomite—160 pts.	1.34	0.923	—0.22	1.45	—0.24	0.351
Atomite— 80 pts.	1.06	0.939	—0.12	1.06	—0.13	0.212
Atomite— 40 pts.	0.83	0.952	—0.08	0.83	—0.08	0.119

* Obtained from slopes of Figures 4 and 5. ** Obtained from slopes of K_R versus T_{AVE} lines similar to those of Figures 4 and 5. K_R at another average temperature can thus be obtained by calculation.

The plot of $1/K_T$ versus μ for the Thermax 80 ball, (measurement of K_T at 210°F.) was used to convert the values of K_T to values of K_R. This was done by assuming that the film coefficient did not vary as a function of the sphere being used. Equation 2 was solved for K_R giving,

$$K_R = \frac{K_T}{1 - C\mu K_T} \tag{3}$$

where C = 0.96 from slope of Figure 7. Thus

$$K_R = \frac{K_T}{1 - 0.96\mu K_T} \tag{4}$$

The values of $\triangle K/\triangle T$ were also converted to $\triangle K_R/\triangle T$ in a similar manner. The results are tabulated in Table V. The correction for the film coefficient, when using higher viscosity silicone oil baths, was necessary because the method for evaluating K *(5)* assumed an infinite film coefficient. This means that the film should present no barrier to the transfer of heat. In a vulcanization press where the rubber compound is pressed against the hot metal surface, it is also assumed that there is no film barrier to heat transfer.

From equation 3, it can be seen that the value $K_T = K_R$ as μ, the viscosity of the bath, approaches 0. The viscosity of the water bath was 0.35 centipoise, which makes the correction very small when using this bath medium. Experimentally, silicone oils eliminate evaporation and the level of the liquid can be maintained just over the rubber sphere and a small part of the thermocouple leads. Silicone oil also allows the experiments to be conducted at temperatures more nearly approaching vulcanization temperatures.

The diffusivity constants for the various butyl-filler compounds are expressed at the average temperature of 210°F. The first column of Table V lists the uncorrected values and the fourth column the corrected values. Values at other temperatures can be obtained by reference to the fifth column indicating temperature dependency. The difference between the corrected and uncorrected diffusivity constant is greater for the higher loaded and more conductive compositions. The differences with gum stocks is only of the order of 5 per cent.

Table V shows, as did Figures 4 and 5, that the conductivity or the diffusivity constant is markedly increased by pigment loading. However, no generalization between the constant values and type of carbon black can be made as shown by the values at a given loading. Atomite whiting, of course, has a higher specific gravity and thus, lower volume fraction for a given weight fraction of filler.

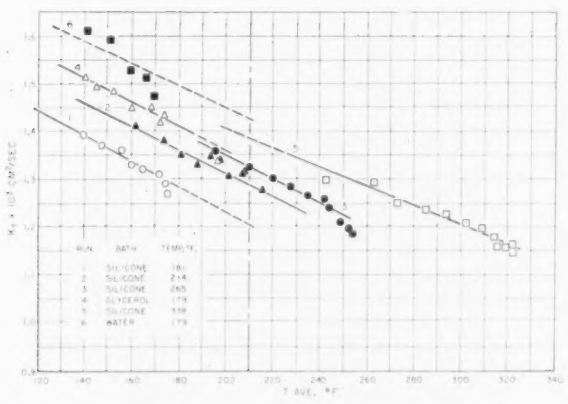

FIG. 6—Thermal diffusivity measurements versus average temperature under different bath conditions (Enjay Butyl 215 with 80 parts of Thermax).

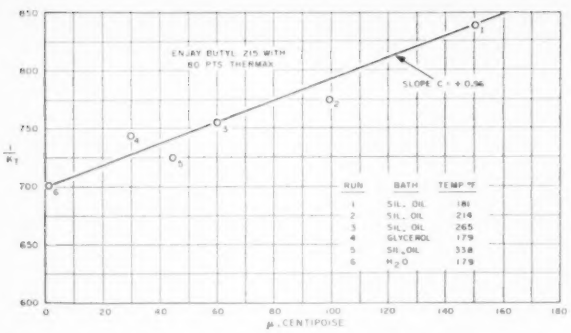

FIG. 7—Thermal diffusivity measurements as a function of bath viscosity at 210°F. versus μ in centipoise.

Two gum vulcanizates, made from butyl rubbers of widely different unsaturation and state of cure (indicated by volume swell values in Table V and Figure 8), show that the state of cross-linking or amount of combined sulfur has no effect upon thermal conductivity. The diffusivity constants for the gum compounds determined in the silicone bath are very similar to the one obtained by Rehner *(4)* on a butyl gum vulcanizate. An interpolated value at 210°F. from Rehner's data would yield a constant of 0.65; the values in this report are 0.70 and 0.67 at 210°F. for butyl gum vulcanizates. The temperature dependency of the values reported here appeared to be less (in a negative way) than those reported by Rehner.

The last column of Table V lists the fractional volume of filler in the total compound. These fractional volumes are plotted as a function of the thermal diffusivity constant in Figure 9. For each individual pigment the relationship appears linear, but, as intimated before, the difference between the lines for each type of carbon black cannot be explained. It probably is a function of free paths within the rubber matrix which can be affected by dispersion, structure, wetting as well as particle size. In the case of the more hydrophilic mineral filler, Atomite, poor wetting with a hydrocarbon substance would contribute to lower conductivities.

As a class, the carbon blacks show much more regularity when the temperature dependency, $\triangle K/\triangle T \times 10^5$, is plotted as a function of filler volume. This is shown in Figure 10 where a slight departure from linearity appears. A projection of this line to zero fractional volume comes close to the temperature dependency of the butyl gum stocks.

The Atomite whiting filler displays a similar descending pattern but at a lower level. This line does not project to a value near that of the gum stock as did the carbon black line. The temperature dependence of a 40 part Atomite stock is near that of the gum stock. This can be further evidence of poor wetting between this filler and the butyl polymer.

Further experiments are suggested from the results so far obtained. It would be of value to expand the information on mineral filled compounds and to alter the effect of pigment wetting by heat treatment on additions of wetting agents. For carbon black compounds the effect of degree of dispersion and pigment wetting should be studied with the new promoted heat treating procedures.

Summary

This report presents the results of experiments to determine thermal diffusivity coefficients, K, for butyl rubber and some of its compounds. Thermal diffusivity is the rate at which a temperature gradient travels through a mass of material. It is related to thermal conductivity by the relation, $K = W/pC$, where W is coefficient of thermal conductivity, p is the density and C the specific heat.

The experimental method is based on the work of Williamson and Adams *(5)*, wherein a sphere of uniform temperature is heated by suddenly immersing it in a constant temperature bath. This bath would hold the surface constant while thermocouples at the center would record the rise in temperature as a function of time. The analogy between such experiments and the heating of a mass of rubber in a vulcanization press is readily apparent.

The treatment of the data obtained is complicated by the fact that the diffusivity of a material changes as the temperature changes. Therefore, the thermal diffusivity coefficients must be reported for a given average temperature coupled with a temperature dependency.

The results of the compounds studied are summarized in columns 4 and 5 of Table V. The thermal diffusivity, K, is expressed in dimensions of square centimeters per second. The larger the value the more conductive the material. Reference to Table V can bring out the following general conclusions:

(1) The diffusivity coefficients for butyl rubber range from 0.67 x 10^{-3} for a given compound to 2.31 x 10^{-3} cm²/sec. for 160 parts of Philblack A per 100 of butyl rubber. These values are determined for an average temperature of 210°F.

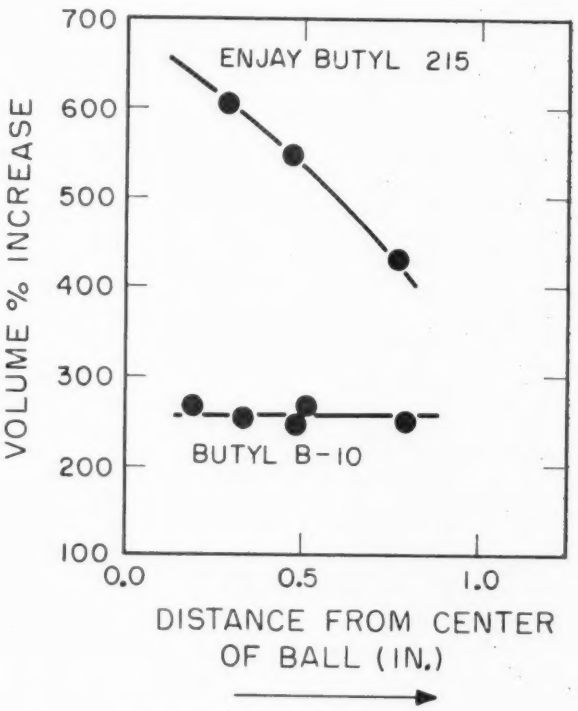

FIG. 8—State of cure of spherical specimens.

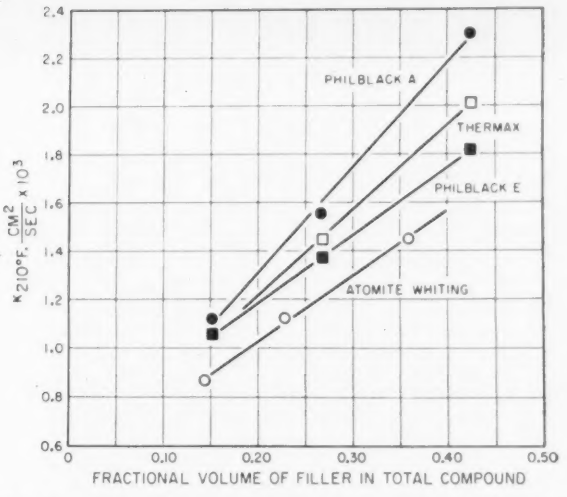

FIG. 9—Relation of thermal diffusivity to filler content (Enjay Butyl 215).

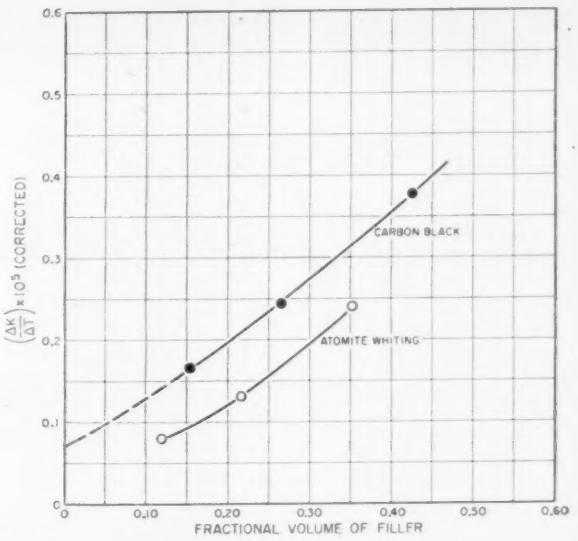

FIG. 10—Temperature dependence of the diffusivity constant and filler loading.

(2) The thermal diffusivity is not dependent upon the state of cure of the rubber. A fully cured Enjay Butyl 215 has a constant of 0.70 x 10^{-3} and a B-10 polymer, at a higher concentration of cross-links, a constant of 0.67 x 10^{-3} cm²/sec. at 210°F.

(3) The higher the loading of carbon black the higher is the thermal diffusivity for a specific temperature.

(4) For a given type of filler, thermal diffusivity varies linearly with increasing volume fraction of filler. No generalization between types of carbon black on particle size can be made at this time. However, the temperature dependency ($\triangle K/\triangle T$) varies almost linearly with only the volume of carbon black and not its type.

(5) Atomite whiting, as a filler, yields compounds with lower thermal diffusivity than carbon. This may be an indication of poorer pigment-polymer wetting.

(6) The thermal diffusivity coefficient (K) varies linearly with temperature with the slope of K versus temperature being negative. This means that the product of p and C increases faster than W in the relation $K = W/pC$ as temperature is raised. Thus, the higher the temperature the less rapid will a gradient travel through the rubber compound. The slope ($-\triangle K/\triangle T$) is greater in a negative direction for the more highly loaded and more conductive compounds.

(7) In conducting the experiments, consideration had to be given to film coefficients between the sphere and the bath liquid. This film coefficient was seen to be dependent upon the liquid bath viscosity. All thermal diffusivity coefficients were corrected to a zero liquid viscosity which would result in an infinite film coefficient (high conductivity).

(8) Thermal diffusivity coefficients of the butyl gum stocks, which can be used as references, compare favorably with the one determined by Rehner *(4)* a decade ago.

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(1) Gurney and Lurie, *Ind. Eng. Chem.*, Vol. 15, p. 1170 (1923).
(2) Memmler, K., "Science of Rubber," pp. 463-64, Reinhold Publishing Corp., New York (1934).
(3) Newman, A. B., *Ind. Eng. Chem.*, Vol. 28, p. 545 (1936).
(4) Rehner, J., *J. Polymer Sci.*, Vol. 2, p. 263 (1947).
(5) Williamson and Adams, *Phys. Rev.*, Vol. 14, p. 99 (1919).

Industrial Gauges Quality Control Instrument

► Industrial Gauges Corp., West Englewood, N. J., has announced a quality control instrument which measures and records diameter deviations in lengths of such materials as wire and thread. The electronic device inspects a convenient length of material from about 0.000 to 0.100 inch in diameter. The samples are taken directly from the production line, run through the gaugehead of the instrument, and the operator adjusts production equipment immediately when diameter deviations fall outside allowable limits. The instrument may be mounted on a portable table or in a fixed position.

Mercury-Actuated Indicating Control

► A mercury-actuated indicating temperature control designed by Raymond Lowey Associates features a novel dual mounting design and greatly improved readability. The instrument, Model MFS, has been introduced by Partlow Corp., New Hartford, N. Y. Said to be accurate to within one-half per cent of scale range, the controller will sense, indicate and control processes within the extreme ranges of —30 to 1100°F. The control is available in ten different scale ranges. Its wide range of application includes all types of process operations, ovens, cooking kettles and packaging lines.

Swelling Behavior of Rubbers Compounded with Reinforcing Pigments

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Research and Development Department, Godfrey L. Cabot, Inc., Cambridge 42, Massachusetts

EQUILIBRIUM swelling data are presented for vulcanizates of natural rubber, butadiene-styrene copolymer 1500, butyl rubber, neoprene, and nitrile rubber containing fumed silica, precipitated silica, precipitated calcium metasilicate, hard clay and carbon black. Swelling media are chloroform, benzene, hexane, and acetone.

It is observed that certain fillers, particularly carbon black, cause a reduction in the swelling of the rubber matrix which is commensurate with the volume loading of the filler. This effect is not specific for a particular solvent or elastomer.

When a series of loadings of a filler shows this effect of reducing the matrix swelling in one solvent, it is also shown by the swelling data for the other solvents, but not to the same degree.

The system butadiene-styrene copolymer-benzene was studied to determine from the bound rubber measurements and the equilibrium swelling data for the corresponding vulcanizates the number of cross-linkages per cubic centimeter in the unvulcanized and vulcanized states. It appears that the number of cross-links estimated in the bound rubber gel is much too small to account for the increase in cross-link density in the rubber matrix that is caused by the presence of carbon black in the vulcanizate.

THE effect of organic solvents on rubber in both its raw and vulcanized forms has been of practical interest to rubber technologists from the earliest days of the rubber industry. Since the solubility and swelling behavior of rubber undergo profound changes by vulcanization, these phenomena have also been of considerable interest in rubber research for estimating vulcanization rates and state or "degree" of cure. Over 30 years ago it was also recognized that the swelling maximum of rubber vulcanizates could be correlated with certain mechanical properties such as extensibility and hardness. In the special and more academic case of "pure" gum vulcanizates these relationships have in recent years been expressed in a quantitative, scientific manner by the statistical network theory of rubber elasticity and the thermodynamics of swelling. The "degree of vulcanization" or "state of cure" as generally conceived can now be expressed most effectively as the density of effective network crosslinks, a quantity easily calculated from equilibrium swelling or modulus determinations.

Although the effect of polymer network structure on swelling and modulus is clearly understood in the case of unfilled systems, the incorporation of fillers causes equilibrium swelling changes which have been the subject of considerable speculation. The fact that fillers reduce the equilibrium swelling volume significantly more than would be anticipated from the simple dilution effect on the polymer was recognized by Scott *(1)* as early as 1926.

Note: This article is based on a talk presented at the Conference of the Rubber Division of the Chemical Institute of Canada, Montreal, Quebec, Canada, May 30, 1956.

It was also noted at this time that the reinforcing fillers, particularly carbon blacks, showed this property to a more pronounced degree than did the inert fillers. This phenomenon suggested a relationship between reinforcement and swelling since the reduction in swelling could be attributed to an increase in the amount of cross-linking or effective network chain density brought about by a chemical combination of polymer molecules with filler surface.

In 1949, Dannenberg *(2)* investigated the effect of a variety of carbon blacks (having a wide range of surface areas) on the reduction of equilibrium swelling volume of a synthetic rubber matrix. It was concluded that the particle size or extent of surface of these carbon blacks had little influence on swelling and, therefore, that possibility of rubber-filler chemical interaction at the interface was not indicated from these experiments. It was shown that the equilibrium swelling decrease of the matrix was greater with increased volume loading and that the "structure" blacks inhibited swelling more than other carbon black grades. Similar observations have recently been made by Kraus in a systematic study of the effective contribution of carbon blacks to network structure *(13)*.

Another phenomenon involving the partial insolubilization of rubber in solvents by reinforcing fillers has been recognized for over 30 years. In recent years numerous investigators have studied this so-called "bound rubber" effect of carbon blacks because of the possibility that it was intimately associated with the mechanism of reinforcement. Dannenberg and Collyer *(3)* reported in 1949 that the quantity of bound rubber with a variety

of carbon blacks was directly proportional to the external surface areas of the blacks determined from electron microscope examination. J. W. Watson *(4)* has recently confirmed these results. This suggests that some sort of interaction occurring at the carbon surface/rubber interface is responsible for the bound rubber effect.

The formation of bound rubber has been taken as proof by a number of investigators of chemical combination of rubber with carbon black. W. F. Watson *(5)* has attributed the formation of bound rubber to the attachment at the carbon surface of rubber free radicals produced during milling by mechanical chain breakdown. An explanation for bound rubber has been proposed by Endter *(6)* based on his observation of electron micrographs of the dried carbon-rubber gel which showed that the bound rubber was not attached to any significant degree to the carbon black surface. Endter suggests that the residual electric field surrounding each carbon black particle induces a polarization of the rubber double bonds resulting in cross-link formation in the immediate vicinity of the carbon black surface.

In regard to both the phenomenon of bound rubber formation in unvulcanized rubber and the reduction of equilibrium swelling of the rubber matrix in vulcanized rubber caused by small particle size reinforcing fillers, it has been unfortunate that most studies have been limited to very specific systems, usually carbon black and either natural or synthetic rubbers. It was felt that in order to have a rational basis for assuming that these phenomena were in some manner related to the mechanism of reinforcement, it would be of value to study a number of small particle size fillers in a variety of rubbers using different solvents. Data presented in this study show how general these effects are in a wide range of diverse systems. Another objective of this investigation was to compare the quantity of "effective cross-linking" produced by fillers in unvulcanized rubber from bound rubber gel swelling with the quantity of "effective cross-linking" in vulcanized rubber contributed by the same fillers from the reduction of rubber matrix swelling.

Organic Solvents and Filler Materials

The solubility of a rubber in a solvent depends on the free energy level of the rubber in the solid state and in the solution. If the partial free energy is lower for the rubber in solution, then in the solid state it will dissolve. This means that rubber molecules will surround themselves by solvent molecules and move out into the solvent, whereas, at the same time, solvent molecules will penetrate into the rubber trying to separate the polymer chains. This process can only be completed when there are no strong bonds such as cross-links between the polymer chains. High-energy bonds between the chains will restrict their mobility so that no chains can migrate into solution.

The penetration of solvent into the cross-linked network is initially unrestricted. However, after the polymer has imbibed a limited amount of solvent the swelling of the polymer is counteracted by the tension that builds up when the chains are stretched between the cross-links. The amount of solvent that will diffuse into the polymer until it reaches equilibrium is dependent on the number of cross-links per cm^3 of polymer or expressed in a different way, on the average length of molecular chain between cross-links. The larger is the number of cross-links per cm^3, the shorter is the average length of chain between cross-links, and the lower is the amount of swelling. This degree of swelling can be expressed by the percentage increase in volume or by the volume fraction of the polymer in the swollen gel.

Studies of Swelling Thermodynamics

The thermodynamics of swelling have been extensively treated by Flory *(7)*, Huggins *(8)* and Gee *(9)*. Their studies allow calculation of the equilibrium swelling from the number of cross-links per cm^3 and the μ factor. The latter is the interaction coefficient and depends mainly on the difference in cohesive energy density between the polymer and the solvent. The reduction in equilibrium swelling of rubber-filler systems due to the presence of filler was observed many years ago for natural rubber compounds. For these compounds aging and depolymerization play an important part and it is difficult to obtain clear-cut swelling equilibria *(1)*. Therefore, relatively little quantitative work was done on swelling of rubber-filler systems.

The work of Dannenberg on the effect of a variety of blacks on the equilibrium swelling in decalin showed small reductions in matrix swelling at increasing loadings of carbon black using various types of blacks. There seemed to be little difference among the blacks, which ranged from reinforcing channel black to non-reinforcing thermal blacks. Only the high structure type blacks, such as Acetylene and HAF, showed significantly lower matrix swelling figures.

The present study covers equilibrium swelling values in chloroform, benzene, heptane, and acetone. The compounds are made with natural rubber, GR-S 1500, butyl rubber, neoprene, and nitrile rubber. The fillers used are channel and furnace blacks, fine silica of the precipitated and the fumed types, a synthetic silicate and a hard clay. The objective of this study is to determine whether the reduction of matrix swelling is a function of type of filler, type of rubber and type of solvent.

The effect of reinforcing fillers on swelling and bound rubber formation is particularly interesting in connection with the theory of reinforcement. The phenomenon of rubber reinforcement by fillers has been claimed to arise from some sort of strong linkages between filler particle and polymer. This means an additional hindrance to the mobility of the polymer chain which should manifest itself by a lower equilibrium swelling if these linkages are of a chemical nature. If the linkage is of a physical nature (adsorption, van der Waal's attraction, or hydrogen bonds), then we might expect the swelling values to be reduced in some weak solvents, whereas strong solvents should give swelling values practically unaffected by the presence of fillers. In the case of hydrogen bonds particularly it may be expected that polar solvents should disengage these bonds and therefore would not show matrix swelling data affected by the filler. Swelling in non-polar solvents, on the other hand, should be strongly affected by loading with fillers or with those fillers that give rise to hydrogen bonds.

The calculations of Flory and Huggins allow us to determine the number of cross-links per cm^3 and, in the

TABLE I—FORMULATIONS OF COMPOUNDS TESTED FOR EQUILIBRIUM SWELLING VALUES

NATURAL RUBBER

BASIC FORMULA

	5 Vol.	10, 20, 30 Vol.
	Parts	
Smoked Sheets	100.0	100.0
Stearic Acid	3.0	3.0
Zinc Oxide	5.0	5.0
Pine Tar 600	3.0	3.0
Paraflux	—	2.5
Diethylene Glycol	—	as indicated
Agerite Hipar	1.0	1.0
Sulfur	2.5	2.5
Santocure	as indicated	as indicated
Filler	as indicated	as indicated
Triethylene Tetramine	as indicated	as indicated

		Pigment Volume Loading on Polymer 5%	10%	20%	30%
Fumed Silica[1]	Parts	11.00	22.00	44.0	66.0
	Santocure	0.60	0.70	1.2	1.0
	Diethylene Glycol	—	1.20	2.5	2.5
	Triethylene Tetramine	—	0.25	0.5	0.8
Precipitated Silica[2]	Parts	9.75	19.50	39.0	58.5
	Santocure	0.60	0.70	0.7	0.8
	Diethylene Glycol	—	1.20	2.5	2.5
Calcium Silicate[3]	Parts	10.50	21.00	42.0	63.0
	Santocure	0.60	0.50	0.5	0.6
	Diethylene Glycol	.00	1.20	2.5	2.5
Hard Clay[4]	Parts	13.00	26.00	52.0	78.0
	Santocure	0.60	0.70	0.7	0.7
	Diethylene Glycol	—	1.20	2.5	2.5
	Triethylene Tetramine	—	0.10	—	0.2
EPC Black[5]	Parts	9.00	18.50	37.0	55.0
	Santocure	0.60	0.50	0.6	0.7
	Diethylene Glycol	—	1.20	2.5	2.5

GR-S 1500

BASIC FORMULA

	Parts
GR-S 1500	100.0
Stearic Acid	2.0
XLC Magnesium Oxide	1.0
Cumar MH 2½	10.0
Zinc Oxide XX78	5.0
Sulfur	2.5
Santocure	as indicated
Diethylene Glycol	as indicated
Filler	as indicated
Triethylene Tetramine	as indicated

(1) Cab-O-Sil, Godfrey L. Cabot, Inc. (2) Hi-Sil, Columbia-Southern Chemical Corp. (3) Silene EF, Columbia-Southern Chemical Corp. (4) Suprex Clay, J. M. Huber Corp. (5) Spheron 9, Godfrey L. Cabot, Inc.

GR-S 1500 *(Cont'd.)*

		Pigment Volume Loading on Polymer 5%	10%	20%	30%
Fumed Silica	Parts	11.00	22.00	44.00	66.00
	Santocure	1.10	1.10	1.25	1.25
	Diethylene Glycol	1.25	1.25	2.00	2.50
	Triethylene Tetramine	0.45	0.90	1.70	2.50
Precipitated Silica	Parts	9.75	19.50	39.00	58.50
	Santocure	1.10	1.10	1.25	1.25
	Diethylene Glycol	1.25	1.25	2.00	2.50
	Triethylene Tetramine	0.10	0.20	0.60	0.80
Calcium Silicate	Parts	10.50	21.00	42.00	63.00
	Santocure	1.10	1.10	1.25	1.25
	Diethylene Glycol	1.25	1.25	2.00	2.5
Hard Clay	Parts	13.00	26.00	52.00	78.00
	Santocure	1.10	1.10	1.25	1.25
	Diethylene Glycol	1.25	1.25	2.0	2.50
	Triethylene Tetramine	0.23	0.45	1.3	2.00
EPC Black	Parts	9.00	18.00	36.00	55.50
	Santocure	1.10	1.10	1.25	1.25
	Diethylene Glycol	1.25	1.25	2.0	2.50

NEOPRENE WRT

BASIC FORMULA

	Parts
Neoprene WRT	100.00
XLC Magnesium Oxide	2.00
Stearic Acid	0.50
Neozone A	2.00
Zinc Oxide	5.00
NA-22	except as indicated, 0.35
Cabflex Di-OA	as indicated
Filler	as indicated

		Pigment Volume Loading on Polymer 5%	10%	20%
Fumed Silica	Parts	11.00	22.00	44.00
	Cabflex Di-OA	4.00	6.00	10.00
	NA-22	0.35	0.35	0.60
Precipitated Silica	Parts	10.00	20.00	40.00
	Cabflex Di-OA	4.00	6.00	10.00
	NA-22	0.35	0.35	0.60
Calcium Silicate	Parts	10.50	21.00	42.00
	Cabflex Di-OA	4.00	6.00	10.00
	NA-22	0.35	0.35	0.35
Hard Clay	Parts	13.00	26.00	52.00
	Cabflex Di-OA	4.00	6.00	10.00
	NA-22	0.35	0.35	0.35
EPC Black	Parts	9.00	18.00	36.00
	Cabflex Di-OA	4.00	6.00	10.00
	NA-22	0.35	0.35	0.35

TABLE I—FORMULATIONS OF COMPOUNDS TESTED FOR EQUILIBRIUM SWELLING VALUES *(Continued)*

BUTYL GR-I 15
BASIC FORMULA

	Parts
GR-I 15	100
Zinc Oxide	5
Stearic Acid	2
ELA	1
Sulfur	2
Selenac	1
Methyl Tuads	as indicated
Diethylene Glycol	as indicated
Filler	as indicated

		Pigment Volume Loading on Polymer			
		5%	10%	20%	30%
Fumed Silica	Parts	11.0	22.0	44.0	66.0
	Methyl Tuads	0.7	0.8	0.9	1.4
	Diethylene Glycol	—	1.5	1.5	1.5
Precipitated Silica	Parts	10.0	20.0	40.0	60.0
	Methyl Tuads	0.5	0.5	0.6	0.7
	Diethylene Glycol	—	1.5	1.5	1.5
Calcium Silicate	Parts	10.5	21.0	42.0	63.0
	Methyl Tuads	0.5	0.5	0.7	0.7
	Diethylene Glycol	—	1.5	1.5	1.5
Hard Clay	Parts	13.0	26.0	52.0	78.0
	Methyl Tuads	0.7	0.8	0.9	1.0
	Diethylene Glycol	—	1.5	1.5	1.5
EPC Black	Parts	9.0	18.5	37.0	55.5
	Methyl Tuads	0.5	0.5	0.6	0.7
	Diethylene Glycol	—	1.5	1.5	1.5

HYCAR 1042
BASIC FORMULA

	Parts
Hycar 1042	100.0
Zinc Oxide	5.0
Stearic Acid	1.5
Spider Sulfur	2.0
Dibutylphthalate	12.5
Picco 25	12.5
Altax	1.3
Methyl Tuads	as indicated
Filler	as indicated
Triethylene Tetramine	as indicated

		Pigment Volume Loading on Polymer			
		5%	10%	20%	30%
Fumed Silica	Parts	11.00	22.0	44.0	66.0
	Methyl Tuads	0.15	0.3	0.3	0.3
	Triethylene Tetramine	0.10	0.3	0.5	0.7
Precipitated Silica	Parts	9.75	19.5	39.0	58.5
	Methyl Tuads	0.10	0.3	0.3	0.3
Calcium Silicate	Parts	10.50	21.0	42.0	63.0
	Methyl Tuads	0.15	0.3	0.3	0.3
Hard Clay	Parts	13.00	26.0	52.0	78.6
	Methyl Tuads	0.15	0.3	0.3	0.3
	Triethylene Tetramine	—	0.1	0.2	0.3
EPC Black	Parts	9.00	19.5	37.0	55.5
	Methyl Tuads	0.15	0.3	0.3	0.3
	Triethylene Tetramine	—	—	0.2	—

case of reduction of equilibrium swelling, the additional cross-links attributable to the filler effect can be calculated. This is an extension of the theory which was not originally intended, and it is not to be taken as proof that actual chemical cross-linkages are present. The application of the theory to filled systems does not serve the practical purpose of giving a quantitative expression for the effect of fillers on swelling.

Bound Rubber

The phenomenon of the insolubilization of part of the rubber by fine particle size fillers such as carbon black, even without any vulcanizing agent being present, has been observed by early investigators in the rubber technology field. With the growing use of synthetic rubber and oil furnace blacks the interest in the insolubilized rubber fraction increased *(11)*. The expressions "microgel," "carbon gel," and "bound rubber" were introduced and a relation between bound rubber and "reinforcement" was assumed *(10)*. Both phenomena apparently depended on the formation of linkages between carbon and polymer. The work of Stearns and Johnson *(12)* suggested that the surface of the black contained unsaturated groups which could be responsible for an actual chemical reaction during the mixing procedure or during vulcanization.

The present study of the butadiene-styrene copolymer GR-S 1500 investigates the number of cross-links per cc of rubber matrix in bound rubber gel fraction. The number of additional crosslinks that are found in the original compound after vulcanization and which are attributable to the presence of filler have also been calculated. These calculations have been made for white fillers and carbon blacks. It will be shown that the carbon blacks behaved in a way different from that of the white fillers investigated.

The main difficulty that exists in interpreting these data lies in the "state of cure" of the vulcanizates. The various fillers affect the rate of cure in degree, and possibly modify the nature and distribution of cross-links. The swelling data are a measure for the degree of cross-linking (cross-link concentration) which is a quantitative expression for the state of cure.

In the attempt to separate these effects from the effect

TABLE II—PROPERTIES OF FILLERS USED IN EXPERIMENTAL FORMULATIONS

	Specific Gravity	Average Particle Size (μ)	Oil Absorption ml./gram	Surface Area m^2/gram	pH in 5% Aqueous Dispersion	Loss @ 105°C. (%)	Ignition Loss 925°C. (%)	Nigrometer Scale	Chemical Composition	Moisture (%)
Fumed Silica	2.24	15–20	1.60	180	4.5	—	—	—	99% SiO_2	0.1–1.8
Precipitated Silica	1.95	22	1.80	150	7.3	5	±9.0	—	87% SiO_2 0.5% CaO 0.2% Fe_2O_3 0.6% Al_2O_3 1.0% NaCl	—
Precipitated Ca Silicate	2.10	30	1.30	80	10.0	5	15.0	—	64% SiO_2 18% CaO 0.15% Fe_2O_3 0.6% Al_2O_3 0.1% MgO 1.5% NaCl	—
Hard Clay	2.60	500–2000	0.35	—	4.5–5.5	—	14.0	—	44–46% SiO_2 38.5% Al_2O_3	1 max.
EPC Black	1.85	30	1.00	100	3.8	0.5–1.5	5.2	85	94% C	—
HAF Black	1.85	35	1.30	65	9.0	0.5	1.6	90	98% C	—

of filler-polymer interaction it is not possible to use exactly the same formulation for the different fillers and for different loadings in a single polymer. Most fillers, particularly the acidic ones, retard the vulcanization process at higher loadings and, if the same recipe and vulcanization time were used as for the lower loadings, the compounds would be definitely undercured. Longer periods of cure do not always give the same state of cure as does a faster curing compound at a shorter cure period because of the familiar phenomenon of reversion which results in a more branched chain network.

Adjustment of Accelerators

The method that has been followed here was to compare the swelling data of compounds that are cured to give maximum tensile strength at the temperature that is normal for the polymer and in a time that is about constant for all compounds of the particular rubber. This method is only possible if adjustments are made in acceleration. This has been achieved by adding a secondary accelerator such as the base, triethylenetetramine, to compounds with acidic retarding fillers (Cab-O-Sil). The amount of secondary accelerator depends on the nature and the loading of the particular filler and was determined experimentally in each case.

It is recognized that this method has its limitations, particularly in extreme cases. In practice, however, the adjustments in auxiliary accelerator do no more than compensate for the retarding effect of such fillers as fumed silica, hard clay, and, to a lesser extent, precipitated silica and channel black. It has the advantage that a constant primary acceleration system can be used.

The formulations were chosen so as to give the same recipe for all fillers in one rubber with small adjustments in accelerator or activator to give the particular compound maximum tensile strength. Data are given in Table I.

The mix was a Banbury Type B at 140°F. for smoked sheets and 120°F. for synthetic rubbers. The batch size was about 1000 cm^3. The milling cycle was as follows:

Minutes	
0	Put rubber into mixer
2	Add ZnO, MgO, ½ filler, ½ softener
4-6	Add remainder of filler and softener (Glycol and triethylenetetramine, if any)
8	Dump

The sulphur and accelerator were added on the roll mill at 140°F. for natural rubber and 120°F. for synthetic rubbers.

Data on the fillers used are given in Table II, and that on the matrix equilibrium swelling for the various compounds produced by the fillers in Table III.

The procedure for the determination of per cent swelling by volume of cured rubber stocks is explained in Appendix A, and that for the determination of per cent bound rubber in Appendix B.

Effects of Solvents on Swelling

The degree of swelling, in general, is highest with chloroform for all polymers except butyl rubber, for which the best solvent is hexane, followed closely by chloroform. The lowest swelling is found with acetone as a solvent, except in the strongly polar nitrile rubber, for which hexane gives the lowest swelling and acetone gives figures of the same order as benzene. The solvent power of benzene follows closely that of chloroform in all polymers tested here.

These differences reflect the drop in free energy of the solvent molecules when they move from their neighbors into the rubber. This is in turn determined by the changes in internal energy and entropy. The tendency of the solvent to swell the rubber is counteracted and finally stopped by the stretching of the chain network. Polar solvents, like acetone and chloroform, will have high swelling power for polar rubbers such as nitrile rubber and neoprene. Benzene, a non-polar but very polarizable molecule, is a very good solvent for almost any polymer.

Compared with the effect of polymer-solvent interaction, the influence of fillers on swelling is relatively

TABLE III—MATRIX EQUILIBRIUM SWELLING OF EXPERIMENTAL COMPOUNDS IN VARIOUS MEDIA

NATURAL RUBBER

		Chloroform	Benzene	Hexane	Acetone
Pure Gum Vulcanizate		460	370	265	18.0
Extrapolated Matrix		—	—	—	—
Fumed Silica	5%	760	420	310	15.1
	10%	535	400	290	14.7
	20%	535	440	330	14.0
	30%	485	415	305	16.8
Precipitated SiO_2	5%	695	380	285	14.8
	10%	505	380	270	13.5
	20%	620	500	390	17.5
	30%	685	500	410	22.0
Precipitated Ca Metasilicate	5%	1110	590	460	13.0
	10%	600	450	325	14.5
	20%	610	470	355	18.0
	30%	560	415	305	17.0
Hard Clay	5%	650	355	265	14.6
	10%	440	330	245	14.0
	20%	420	310	235	13.4
	30%	390	295	230	12.0
EPC Black	5%	625	355	270	14.1
	10%	550	410	300	13.4
	20%	470	370	275	13.8
	30%	390	295	220	14.0

GR-S 1500

		Chloroform	Benzene	Hexane	Acetone
Pure Gum Vulcanizate		580	525	175	15.5
Extrapolated Matrix		475	395	140	15.0
Fumed Silica	5%	480	395	145	15.0
	10%	475	400	150	16.0
	20%	470	395	125	15.0
	30%	485	410	110	14.0
Precipitated SiO_2	5%	530	450	150	15.4
	10%	540	465	160	14.4
	20%	485	410	170	13.4
	30%	485	410	100	11.5
Precipitated Ca Metasilicate	5%	520	430	145	16.0
	10%	505	425	150	14.9
	20%	475	480	180	14.0
	30%	455	390	100	13.3
Hard Clay	5%	490	400	142	14.4
	10%	475	390	145	16.1
	20%	530	450	200	11.5
	30%	575	485	120	8.4
EPC Black	5%	635	470	155	17.3
	10%	535	445	155	17.9
	20%	425	350	160	14.9
	30%	365	320	90	13.6
HAF Black	5%	—	490	—	—
	10%	—	445	—	—
	20%	—	410	—	—
	30%	—	350	—	—

BUTYL RUBBER

		Chloroform	Benzene	Hexane	Acetone
Pure Gum Vulcanizate		350	185	340	5.5
Fumed Silica	5%	375	320	470	5.1
	10%	300	330	465	7.7
	20%	380	195	375	8.2
	30%	340	180	360	10.1

BUTYL RUBBER *(Cont'd.)*

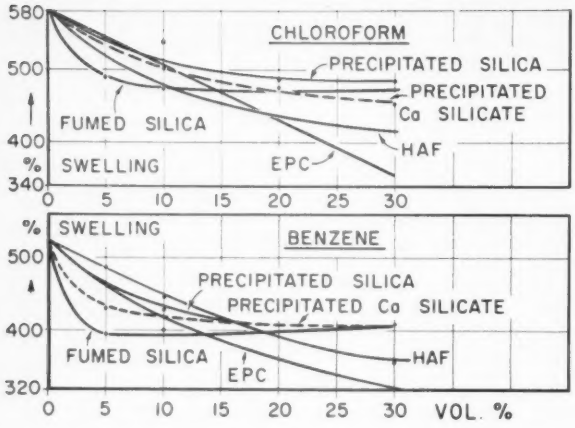
		Chloroform	Benzene	Hexane	Acetone
Precipitated SiO_2	5%	375	315	470	4.7
	10%	335	315	460	6.3
	20%	320	170	335	5.3
	30%	—	—	—	—
Precipitated Ca Metasilicate	5%	400	320	485	4.9
	10%	335	280	455	6.2
	20%	315	170	320	5.4
	30%	285	160	300	6.8
Hard Clay	5%	360	310	460	5.1
	10%	335	320	460	7.4
	20%	340	175	355	7.7
	30%	370	195	380	8.0
EPC Black	5%	345	305	450	5.3
	10%	310	310	440	7.0
	20%	295	160	305	7.8
	30%	290	165	300	6.5

NEOPRENE RUBBER

		Chloroform	Benzene	Hexane	Acetone
Pure Gum Vulcanizate		520	450	56.0	48.0
Fumed Silica	5%	555	465	55.0	41.0
	10%	585	485	57.0	45.0
	20%	460	380	—	32.0
	30%	305	295	52.0	36.0
Precipitated SiO_2	5%	490	415	58.1	39.7
	10%	530	445	55.1	42.6
	20%	465	360	48.4	33.5
	30%	—	—	—	—
Precipitated Ca Metasilicate	5%	505	410	52.5	38.8
	10%	480	395	56.6	41.8
	20%	460	365	—	28.5
	30%	—	—	—	—
Hard Clay	5%	580	475	50.0	39.0
	10%	625	520	56.0	43.0
	20%	500	415	—	32.0
	30%	—	—	—	—
EPC Black	5%	505	435	49.9	37.6
	10%	510	425	54.4	42.7
	20%	375	320	—	29.0
	30%	—	—	—	—

NITRILE RUBBER

		Chloroform	Benzene	Hexane	Acetone
Pure Gum Vulcanizate		630	290	25.1	250
Fumed Silica	5%	660	320	18.0	275
	10%	660	275	6.3	250
	20%	635	270	4.3	260
	30%	650	270	5.4	270
Precipitated SiO_2	5%	515	320	15.5	275
	10%	730	300	3.9	263
	20%	738	277	2.2	266
	30%	750	305	4.6	281
Precipitated Ca Metasilicate	5%	640	285	16.5	240
	10%	740	300	8.0	258
	20%	700	270	1.5	259
	30%	680	280	3.5	267
Hard Clay	5%	655	305	16.8	275
	10%	740	304	8.1	265
	20%	770	290	6.4	270
	30%	720	295	6.2	265
EPC Black	5%	640	285	16.5	240
	10%	630	280	7.6	233
	20%	605	265	6.3	231
	30%	530	245	6.2	210



Swelling of styrene rubber matrix as a function of filler loading of the compound.

small and, since swelling data are difficult to reproduce, the filler effect sometimes does not amount to much above the average error of measurement. There are a number of effects, however, that can be detected without any doubt. These are:

(1) The matrix swelling of the rubber of highly filled compounds is usually smaller than that of the pure gum rubber. This means that the fillers have some restricting influence on the mobility of the polymer chains. Deviations from this rule are found at low and intermediate loadings and particularly in natural rubber where swelling is affected strongly by oxidation processes.

(2) There is a very pronounced decrease in matrix swelling with some fillers when the filler loading is increased. This is the case with carbon black, and, as the accompanying graph shows, it is almost a linear function of the loading, particularly with the channel black. This effect is more pronounced with stronger swelling solvents; the very weak swelling agents show hardly any effect.

The non-black fillers cause a reduction in matrix swelling which, however, does not seem to depend so much on the loading of the filler, as is the case with the blacks. There are some exceptions, however, with fumed silica (natural rubber—chloroform; neoprene—chloroform; neoprene—benzene) and hard clay (natural rubber—chloroform).

In a number of cases the effect of loading on the matrix swelling is negligible though the presence of the filler reduces the swelling of the vulcanizate at the lowest loading used here (5 per cent volume) as compared with the pure gum vulcanizate. In some cases small amounts of filler increase the volume swelling. The most pronounced cases of reduction in matrix swelling with loading are the following:

Natural Rubber: ..... MPC black in chloroform and benzene; pyrogenetic silica in chloroform.

GR-S 1500: ..... MPC in chloroform, benzene and hexane.

Neoprene WRT: ..... MPC in chloroform and benzene; pyrogenetic silica in chloroform and benzene.

Butyl Rubber: ..... All fillers in benzene and, to some degree, in hexane; small effects in chloroform.

Nitrile Rubber: ..... No large effects with any combination; a remarkable reduction is noticeable from 5 to 10 volumes of all fillers in hexane as a solvent.

This shows that the MPC black causes the effect in all rubbers and solvents except in Hycar, where all effects are small. In general, this effect will occur with all solvents in a polymer, though it may be less pronounced with the solvents that have small swelling values. These weak solvents would only break very weak linkages, whereas solvents with strong swelling tendencies would break stronger bonds.

If the effect of decreased swelling by increased filler loading were only noticeable with the weak solvents and not with the strong, it could be concluded that the fillers only contributed weak bonds. If, conversely, the effect were noticeable with strong solvents only, it would mean that the fillers only contributed strong bonds. Actually the effect is noticed with both types of solvents, though it is more pronounced with the stronger solvents. In other words, the filler mainly causes formation of strong bonds, though apparently weaker bonds are also contributed.

Bound Rubber and Cross-Link Density

Various authors have assumed that the phenomenon of bound rubber is related to reinforcement. Bound rubber, the rubber which is bound by the pigment to an insoluble gel after the pigment has been milled into the rubber, is determined by a standard procedure of extraction with benzene. During this extraction, the soluble rubber is separated from the insoluble rubber-black gel, which is highly swollen. It is logical to measure the degree of swelling of this fragile gel and determine the concentration of cross-links of the rubber component of the swollen compound. The calculation does not presume anything about the nature of the cross-links except that they are strong enough to withstand the forces exerted by the expansion due to the imbibition of the solvent.

Since we are mainly interested in the order of the effect as compared with swelling effects after vulcanization, the simplified Huggins equation was used without the refinement corrections:

$$\frac{\Delta F}{RT} = O = \ln v_1 + v_2 + \mu v_2^2 + \frac{\rho_2 V_1}{M_c} v_2^{1/3}$$

or

$$\frac{1}{M_c} = -\left(\frac{\ln v_1 + v_2 + \mu v_2^2}{\rho_2 V_1 v_2^{1/3}}\right)$$

or

$$\frac{2}{M_c} = -\left(\frac{\ln v_1 + v_2 + \mu v_2^2}{V_1 v_2^{1/3}}\right)$$

In this system the index 1 indicates the solvent and the index 2 indicates the polymer. Here

$v_2 = 1\text{-}v_1 =$ the volume fraction of the polymer, related to the degree of swelling Q (in per cent),

$$v_2 = \frac{100}{100 + Q},$$

$V_1 =$ molecular volume of the solvent,

$\rho_2 =$ density of the polymer,

$\mu =$ the interaction coefficient of the rubber-solvent system, and

$M_c =$ average molecular weight of a chain length between two cross-links.

It is realized that there may be objections to using the Huggins formula for such high degrees of swelling as occur in the bound rubber matrix, but, here again, the desired degree of accuracy is not so high that this would interfere with the conclusions.

The entity $\frac{\rho}{M_c}$ is the number of chains per cm^3 and roughly $\frac{\rho}{2\,M_c}$ will be the number of cross-links per cm. Again no correction is made for loose, floating chain ends.

Table IV compares swelling data of the vulcanizate matrix with those obtained on the bound rubber gel matrix for a number of GR-S 1500 compounds. In both cases these data are also expressed in concentration of cross-links, computed by the Huggins formula above. This is done with two blacks and three white fillers, all at loadings of 5, 10, 20 and 30 per cent volume.

The first five compounds are made with EPC black and the swelling data indicate a steady increase of the concentration of cross-links with increased loading. For the pure gum vulcanizate the concentration of mol cross-links is 44 (per 10^6 cc); for the 30 per cent volume loaded vulcanizate it is 108 (per 10^6 cc) of the same units, an increase of 64 units.

Looking at the bound rubber values, it appears that even at 30 per cent volume loading the concentration of cross-links in the gel matrix amounts to only 1.7 (per 10^6 cm^3). Since the percentage of bound rubber is only 26.4, the bound rubber cross-links would only amount to

$$\frac{26.4 \times 1.7}{100} = 0.45$$

units. This indicates that the increase in cross-link concentration from 44 to 108, which occurs when the compound is loaded with 30 per cent volume of black, cannot be attributed to bound rubber cross-links.

A similar picture is shown by the HAF black compounds. Here the 30 per cent volume black vulcanizate has 46 cross-links (per 10^6 cc) more than the pure gum compound, whereas only

$$\frac{33.4 \times 5}{100} = 1.6$$

units may have been contributed by bound rubber under the conditions it was measured.

These two very obvious phenomena indicate that there must be an effect by carbon black on the vulcanization reaction which causes a higher concentration of cross-links than is found in the absence of black and which is of a much larger order of magnitude than the cross-linkage found in bound rubber.

In the case of the white pigments, fumed silica, precipitated silica, and calcium metasilicate, the effect of loading on the cross-link density is less pronounced. For fumed silica, this value is practically independent of loading though higher than that for the pure gum vulcanizate. The bound rubber cross-links form a significant percentage in the case of the 30 per cent volume loading vulcanizate. This, however, shows no higher cross-link density than the lower loaded compounds where bound rubber cross-links are negligible.

TABLE IV—NUMBER OF CROSS-LINKS IN VULCANIZED GR-S 1500 COMPOUND MATRIX AND BOUND RUBBER MATRIX

	Vulcanizate			Bound Rubber		
Filler	Volume Loading (%)	Matrix Swelling (%)	Nc x 10^6	(%)	Matrix Swelling (%)	Nc x 10^6
EPC Black	0	525	44	—	—	—
	5	470	53	—	—	—
	10	445	58	6.1	10,800	0.09
	20	350	91	20.6	4,150	1.15
	30	320	108	26.4	3,300	1.7
HAF Black	5	490	48	—	—	—
	10	445	58	4.0	—(490)	(0.9)
	20	410	70	16.7	3,300	1.7
	30	350	91	33.4	1,780	5.0
Fumed Silica	5	395	72	10.5	5,700	0.7
	10	400	71	22.8	2,700	2.5
	20	395	72	46.1	1,230	9.6
	30	410	70	52.3	1,030	14.0
Precipitated Silica	5	450	57	—	—	—
	10	460	55	—	—	—
	20	410	70	17.3	3,080	1.9
	30	410	70	25.6	2,050	4.0
Precipitated Ca Silicate	5	430	63	—	—	—
	10	425	64	—	—	—
	20	480	46	13.3	7,000	0.45
	30	390	73	20.2	5,100	0.79

Similar considerations hold for the two other white pigments; both show much lower bound rubber values and an approximately constant concentration of cross-links in the vulcanizates at the different loadings.

The final conclusion from the above quantitative considerations is that the bound rubber phenomenon, as measured by the procedure outlined here, has no significant effect on the increased cross-linking of the rubber matrix of the vulcanized stocks resulting from the presence of fillers. The increased cross-linking occurs, therefore, during the vulcanization reaction.

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Appendix A—Procedure for the Determination of Per Cent Swelling by Volume of Cured Rubber Stocks

A weighed 1 x 2 inch specimen whose specific gravity is known is immersed in 100 ml. of the solvent which is contained in a 250 ml. test tube. The test tube and contents are then placed in a dark cabinet in a room in which the temperature is maintained at 70°F. The time lapse is seven days unless otherwise specified. At the end of the time interval, the specimen is removed from the solvent, lightly blotted dry, and quickly weighed in a pre-weighed bottle with ground glass cover.

Calculations:

$$\frac{\text{gain in weight}}{\text{gravity of solvent}} \times \frac{\text{gravity of specimen}}{\text{original weight of specimen}} \times 100 = \% \text{ swelling by volume}$$

Frequently used solvents and their specific gravities:

Benzene	0.879
Chloroform	1.498
Acetone	0.792
Hexane	0.660
Cyclohexane	0.779

Appendix B—Procedure for Determination of Per Cent Bound Rubber

Bound rubber is expresed as the amount (percentage) of the polymer in a compounded but uncured stock which fails to dissolve in benzene after standing for 24 hours.

Operational Procedure

The procedure of calculating bound rubber is as follows: A small strip is cut from the stock to be tested. Care is taken to trim all outer surfaces which may have been exposed to oxidation. The strip is then cut into 12 sections, total weight of which is 0.30 to 0.32 grams.

Each section is now inserted on individual screen tiers. The screen is placed in the container and 100 ml. of C. P. benzene are pipetted over the screen and into the container. The apparatus is kept in a place of constant temperature, 70°F., for a period of 24 hours.

At the end of this period, the benzene, containing any dissolved polymer, is withdrawn into a 250 ml. flash. A 50 ml. aliquot is transferred from the flask to a previously weighed 100 ml. beaker. This solution is then evaporated to a point where all of the benzene but none of the polymer has been removed. The beaker is then desiccated and reweighed to determine the residue weight.

Calculation of per cent bound rubber is as follows:

$$\% \text{ Bound Rubber} = 100 - \left(\frac{2A}{R} \times 100\right)$$

where A = weight of dissolved polymer,
R = weight of polymer in original sample, and
2A = total residue weight — that fraction of the residue weight attributed to benzene-soluble components of the compound.

Benzene Swelling

To determine benzene swelling with bound rubber, immediately after the benzene solution has been drained from the bound rubber apparatus, weigh 3 or 4 of the rubber gels (which have just been benzene extracted) into a preweighed weighing bottle which is quickly covered to prevent evaporation while weighing. After it is weighed, remove the cover and let it stand exposed to the air overnight. Cover again and reweigh.

Calculation of per cent benzene swelling is as follows:

$$\% \text{ Volume Swelling} = \frac{(\text{S. G. of gel})\,(\text{benzene weight})}{(\text{S. G. of benzene})\,(\text{dried gel weight})} \times 100$$

$$\text{Specific Gravity of Gel} = \frac{\text{Weight \% of carbon black} + \text{Weight \% of bound rubber}}{\text{Volume \% of carbon black} + \text{Volume \% of bound rubber}}$$

Benzene Weight = first weight — weight after evaporation

Swelling of the Rubber Matrix

To calculate per cent volume swelling of the rubber matrix alone, the following equation is used:

$$\frac{\dfrac{S}{0.879}\,(L + Br)}{(T\text{-}S)\,\dfrac{Br}{S.G.}} \times 100 = \% \text{ Swelling}$$

where S = weight of benzene absorbed by the gels (weight of saturated gels minus weight of gels after evaporation),
L = original carbon black (or reinforcing agent) loading (phr),
Br = per cent bound rubber,
T-S = weight of dry gels (total saturated weight minus weight of benzene evaporated), and
S.F. = specific gravity of polymer.

Sample Calculation

An example of the calculation of the per cent bound rubber follows: A residue of 0.0799 grams was obtained using original sample weight of 0.306 grams. The following compounding recipe had been followed:

	Weight (g)	C_6H_6 Soluble	C_6H_6 Insoluble
GR-S	500.5	...	500.5
Carbon Black	250.0	...	250.0
Stearic Acid	15.0	15.0	...
Pine Tar	15.0	15.0	...
Sulfur	12.5	12.5	...
Santocure	2.5	2.5	...
Zinc Oxide	25.0	...	25.0
Agerite Hipar	5.0	5.0	...
Total	825.5	50.0	775.5

Factors to be used in calculations:

$$\text{For Solubles: } \frac{50}{825.5} = 0.0606$$

$$\text{For GR-S: } \frac{500.5}{825.5} = 0.606$$

Calculations:

$$100 - \left[\frac{2\,(.0799\text{ g.}) - .0185\text{ g.}}{0.185\text{ g.}} \times 100\right] =$$

$$100 - \left(\frac{.1413}{.185} \times 100\right)$$

= 100 — 76.5 = 23.5% bound rubber.

The Irving B. Moore Corp.

credits thriving sales

to customer-attracting

Special Services and Products

for users of mechanical rubber goods

BY OFFFERING many special services and products, Irving B. Moore Corp., Boston, Mass., jobbers and fabricators of mechanical rubber goods, boosts sales of its standard stock. The standard, factory-made items such as, for example, rubber hose manufactured by the Thermoid Co., accounts for 80 per cent of the sales of the firm, and the specials account for the other 20 per cent. But the company credits many purchases of its standard items to the customer-attracting specials.

One of the fundamental rules of Paul B. Moore, son of the founder and president, is quick service. This means more than just having a large stock; it means having equipment to make the items in stock fit the customer's needs. For instance, in an emergency, hose of all types and sizes can be coupled and ready for delivery within a few hours or even minutes. Often a break in a hose will cause the shut-down of a large machine. Fast service in returning that expensive piece of equipment to production brings Moore to mind when the user is in the market for standard hose in quantity.

O-Rings in Special Size and Quantity

The company does a big business in special O-rings in lengths and diameters and in quantities that primary manufacturers find unprofitable. From supplies of round rubber stock in a wide range of diameters, O-rings of any length are made by bias cutting (Figure 1), cementing, vulcanizing (Figure 2), and curing in an electric oven. O-rings of all types of rubber, including silicone rubber, can be furnished by Moore. Again, prompt delivery, within 24 hours, helps get the order. Many cases are on record of an order for one special ring being fol-

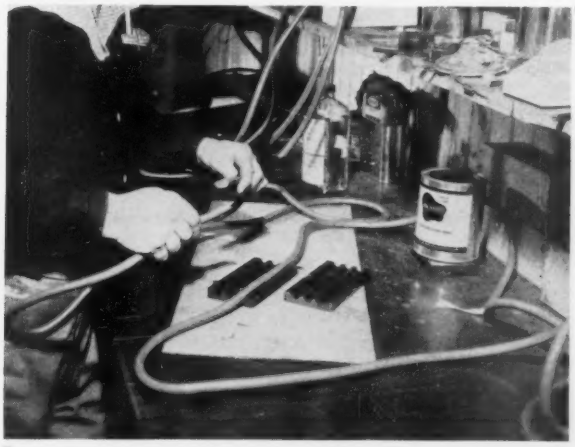

FIG. 1—Special O-Ring of many types of rubber can be made by Moore in quantities of from one up. The operator is bias cutting a piece of the rubber stock available in a wide range of diameters.

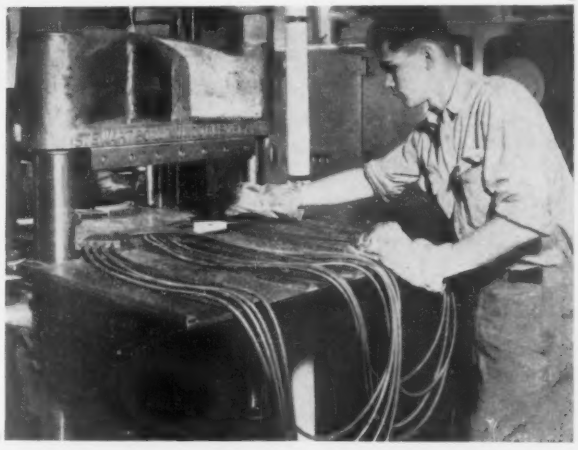

FIG. 2—Spliced O-rings are placed in molds and vulcanized in this 24-inch double deck press prior to curing in an electric oven. In the background is a calibrated oven used to cure silicone rubber.

FIG. 3—Rectangular pads, discs and special shapes, like the mat for the floor of a truck being cut above, feature in Moore's sales. A "clicker" machine utilizes steel rule dies to cut out any shape.

lowed by other orders for quantities up to thousands.

Square, round, oblong and special shapes are cut from sheet rubber stock with a "clicker" which uses inexpensive steel rule dies, as seen in Figure 3. With ample stocks of rubber sheet on hand, plus the "clicker" machine for cutting at low cost, a considerable volume of business in special-shape pieces has been developed.

Although Moore does not employ a rubber chemist, compounding special rubbers is one of the services offered. The company has the necessary equipment: a laboratory size mill, a 24-inch double deck vulcanizing press, a curing oven and molds. Technical assistance is obtained from manufacturers of rubber chemicals and from their technical publications.

With years of experience in mechanical rubber goods, both standard and special, the Moore Corp. is in a position to give valuable engineering advice. Its personnel can describe how a particular problem can be solved with a specially designed rubber part, and then make the item singly or in quantity. Depending on the need for molds, the part can be shipped within 24 hours.

Jobber-Manufacturer Cooperation

Moore is alert to special problems in its area that can be solved by slight modifications of standard items. In New England, for instance, there are thousands of boats with inboard engines on which a small piece of hose forms a flexible connection on the exhaust pipe. Heat, fumes, oil, grease, constant heating and cooling make a standard hose unsuitable. At Moore's suggestion, the Thermoid Co. modified one of its standard hoses so that it would meet the conditions of this service. Cooperation between jobber and manufacturer has increased the sales of both.

The personnel of the firm consist of an inside force of seventeen and three field representatives who make calls within the New England area. A substantial amount of business on special items comes in by mail from customers in other sections of the country.

Coming Next Month...

Elastomers for Use in Radiation Fields. Part III: Effects of Gamma Radiation on Acrylic, Chlorosulfonated Polyethylene, Chloroprene, Nitrile and Styrene Elastomers—By Robert Harrington, Hanford Atomic Products Operation, General Electric Co., Richland, Wash.

Physical property changes of numerous elastomers, with data on damage resistance. Effects of changes in compounding. Trends as determined by comparisons of the different kinds of polymers.

Thermal Diffusivity of Butyl Rubber and Its Compounds. Part II: Application of the Diffusivity Coefficients—By Donald R. MacRae and R. L. Zapp, Enjay Laboratories, Linden, N. J.

Use of coefficients determined in Part I applied to representative heating problems during vulcanization, such as temperatures of centers of slabs of rubber.

Compounds for High Temperature Fuel Seals—By E. J. Fujiwara, W. G. Lajiness, L. C. Smith and R. G. Spain, Wyandottee Chemicals Corp., Wyandottee, Mich.

Results of a study concerned with properties of elastomers at high temperatures while immersed in aircraft fuels. Design and operation of a testing machine and evaluation of various polymers.

Properties and Uses of Fusible Silicone Rubber Compounds—By F. Fekete and J. H. Lorenz, Union Carbide Corp., Tonawanda, N. Y.

Analysis of a new family of silicone rubber compounds which are fusible, with an insulating and a conductive member presented in detail. Applications, including use in non-supported tapes, are discussed.

Report on a laboratory investigation to develop

IMPROVED LIGHTWEIGHT REFUELING HOSE

By S. A. ELLER, A. A. STEIN, E. SOLON, H. J. BORSTELL

Material Laboratory, New York Naval Shipyard, Brooklyn 1, N. Y.

and C. K CHATTEN

Head, Elastomers Development Section, New York Naval Shipyard, Brooklyn 1, N. Y.

THE United States Navy uses refueling hose to transfer fuel oil and gasoline from ship-to-ship at sea. The effective size, range and efficiency of the fleet are thus increased as warships can maintain high speeds far from their bases without the necessity for refueling at shorebased installations.

The refueling hose used for this purpose is required to convey gasoline and heated fuel oil at pressures up to 100 psi while hanging from supports that are spaced relatively far apart. This condition, combined with the weight of the hose and the fuel contained therein, cause the hose to be subjected to severe bending and shear stresses.

The hose is also subjected to tensile forces of extremely high but indeterminate magnitude when the supply and receiving vessels veer apart faster than additional hose can be payed out, and to being kinked and dragged through the ocean when the vessels draw together unexpectedly. In addition, the hose is exposed to weathering and is stored in a crimped position for prolonged periods of time.

Despite these severe service conditions, the Navy is constantly interested in reducing the weight of refueling hose to provide easier transfer of the hose between vessels.

Recently, a new construction of refueling hose was developed that has received favorable comment from the fleet regarding weight and ease of handling, but which has been subject to early failure in service. To improve the construction of this type of refueling hose, the Material Laboratory carried out a simulated service investigation on 2-inch I.D. models of refueling hose supplied by a number of commercial rubber manufacturing concerns.

This investigation was carried out in collaboration with Messrs. Browning and Croy of the Bureau of Ships, Navy Department, Washington 25, D. C., who are jointly responsible for establishing specifications for Naval refueling hose.

The samples consisted of 18 models of refueling hose received from eight manufacturers, identified in this article by code letters. The models measured 2 inches I.D. by about 3 inches O.D., and were constructed with the identical cover, reinforcement and tube materials that would be used in manufacturing 6-inch I.D. refueling hose made to conform to specification MIL-H-19091A *(1)*. The dimensions of the models are tabulated in Table I.

Note: The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

Simulated Service Flexing Test

A 3-foot section of each hose model was subjected to a simulated service flexing test. The flexing apparatus consisted essentially of an oscillating arm to which two hose models were secured and a pair of 2-inch diameter rollers over which the hoses were flexed. The lower portions of the hoses were held in proper flexing position by sets of 1-inch diameter retaining rollers located directly below the flexing rollers. The oscillating arm moved through an angle of 90 degrees on either side of the normal perpendicular position, as shown in Figure 1. The arm was driven by a simple harmonic device that converted the rotating motion of an electric motor into oscillatory motion and made 745 complete cycles per hour. The flexing machine, located on the roof of the Laboratory building, was exposed to outdoor weather conditions.

The 3-foot long hose sample was filled with Type II fluid conforming to specification MIL-S-3136A *(2)*. The composition, by volume, of this fluid is iso-octane (60%), benzene (5%), toluene (20%) and xylene (15%). Immediately after filling the hose, it was secured to the oscillating arm of the flexing machine, as shown with two models secured thereto in Figure 2. The apparatus was operated to flex the hose for eight consecutive hours and then stopped so that the hose was held in the vertical (straight) position for the next 16 hours. This procedure was repeated during the succeeding 24 hour period.

At 9:00 a.m. on the third morning, the hose was removed from the flexing machine, the Type II fluid was drained, and the sample was subjected to a hydrostatic pressure of 200 psi held for ten minutes. The hose was then refilled with the Type II fluid and allowed to remain at room temperature (75° ± 5° F.) for a period of approximately 22 hours, following which the

TABLE I—DIMENSIONS OF HOSE MODELS AND PHYSICAL PROPERTIES OF THEIR COMPONENTS

Code	Dimensions of Models			Thickness			Reinforcement	
	I.D., in.	O.D., in.	Length, in.	Tube, in.(2)	Carcass, in.	Cover, in.(2)	Bias Angle, deg.	Cords per in.
Specified in MIL-H-19091A	—	—	———	0.062 (min.)	——	0.047 (min.)	45-55	—
A-1	2	3	35½, 12(1)	0.110	0.250	0.045	47	33
A-2	2	3	36, 12(1)	0.095	0.250	0.040	47	23
A-4	2	3	36½, 36(1)	0.140	0.285	0.120	49	21
B-1	2	2¾	47½	0.080	0.170	0.090	49	36
B-2	2	2¾	47½	0.090	0.120	0.070	49	28
B-3	2	2¾	47½	0.125	0.110	0.072	49	24
E-1	2	2¾	73	0.075	0.200	0.050	48	26
F-1	2	2½	72	0.106	0.150(3)	0.045	46	34
H-1	2	2¾	78	0.120	0.250	0.100	49	40
H-2	2	2¾	78	0.120	0.150	0.070	49	24
A-3	2	3	36½, 12(1)	0.070	0.250	0.075	47	22
C-1	2	3	72	0.085	0.225	0.080	52	30
D-1	2	2¾	72	0.080	0.225	0.050	48	28
D-2	2	2¾	72	0.080	0.250	0.050	49	26
G-1	2	2⅞	72½	0.125	0.160	0.070	55	42
G-2	2	2⅝	72	0.125	0.180	0.070	53	24
H-3	2	2¾	78	0.072	0.190	0.069	49	30
H-4	2	2¾	78	0.075	0.150	0.110	49	27

(1) Two lengths of hose received; (2) Thickness measured on buffed specimens; (3) Considerable variation in wall thickness.

TABLE II—CONSTRUCTION OF HOSE MODELS AND RESULTS OF SIMULATED SERVICE FLEXING TESTS

Code	Tube Material	Reinforcement	Effect of Simulated Service Flexing Test
Specified in MIL-H-19091A	Neoprene or a copolymer of butadiene	Nylon or rayon fabric plies of tire cord construction.	
A-1	Neoprene	A layer of cotton duck fabric impregnated with neoprene was adhered to the fluid side of the tube. Eight plies of nylon tire cord fabric were applied over the tube.	Three blisters, each approximately 4 in. by ¼ in. by ⅛ in. high, formed at the interface between the layer of cotton duck fabric and the tube material. These blisters are shown on the exploded view of the hose, Figure 3.
A-2	Neoprene	A layer of cotton duck fabric impregnated with neoprene was adhered to the fluid side of the tube. Eight plies of nylon tire cord fabric were applied over the tube.	Numerous blisters, each about ⅛ in. high, formed in two areas, each area measuring approximately 1 in. by 3 in. These blisters were located at the interface between the cotton duck fabric and the tube material. The blisters were similar in appearance to those shown in Figure 3.
A-4	Neoprene	Ten plies of nylon tire cord fabric.	No apparent damage.
B-1	Neoprene	Four plies of rayon tire cord fabric.	At locations on the sample approximately 4 in. and 10 in. above the centerline of the flexing rollers, circumferential portions of the tube material were badly blistered, twisted and distorted. The hose sample at both of these locations had been subjected to bending. At the upper location, the sample had been subjected to an additional bend due to the unsupported weight of the couplings. Examination of both damaged areas indicated that there was poor adhesion between the layers of tire cord fabric and between components of the hose. The appearance of the hose following this test is shown in Figure 4.
B-2	Neoprene	Two plies of nylon tire cord fabric over the tube followed by four plies of rayon tire cord fabric.	A blistered area about 1 in. long and extending completely around the tube occurred on the portion of the hose that was bent over the flexing rollers. Examination of the damaged area indicated that there was poor adhesion between the layers of tire cord fabric and between the components of the hose, similar to that shown in Figure 4.

TABLE II—CONSTRUCTION OF HOSE MODELS AND RESULTS OF SIMULATED SERVICE FLEXING TESTS

(Continued)

Code	Tube Material	Reinforcement	Effect of Simulated Service Flexing Test
B-3	Neoprene	Two plies of nylon tire cord fabric over the tube followed by four plies of rayon tire cord fabric.	At locations on the sample approximately 4 in. and 9 in. above the centerline of the flexing rollers, circumferential portions of the tube material were badly blistered, twisted and distorted. The hose sample at both of these locations had been subjected to bending. At the upper location the sample had been subjected to an additional bend due to the unsupported weight of the couplings. Examination of both damaged areas indicated that there was poor adhesion between the plies of tire cord fabric and between components of the hose. The appearance of the hose following this test is similar to that shown in Figure 4.
E-1	Neoprene	Six plies of nylon tire cord fabric.	A blister, approximately ¾ in. long by ⅜ in. wide, wherein the tube material separated from the carcass occurred in that portion of the hose that was bent over the flexing rollers.
F-1	Neoprene	Four plies of rayon tire cord fabric.	No apparent damage.
H-1	Neoprene	Six plies of rayon tire cord fabric.	No apparent damage.
H-2	Neoprene	Four plies of nylon tire cord fabric.	No apparent damage.
A-3	Nitrile	A layer of cotton duck fabric impregnated with nitrile rubber was adhered to the fluid side of the tube. In addition, 10 plies of nylon tire cord fabric were applied over the tube.	A blister, approximately 3 in. by 2 in., occurred between the layer of cotton duck fabric and the tube material on the portion of the hose that was bent over the flexing rollers. Examination of the blister indicated that there was delamination of the tube material and poor adhesion at the interface between the cotton duck fabric and the tube.
C-1	Nitrile	Eight plies of rayon tire cord fabric. In addition, the hose sample had a nitrile gum layer barrier between the tube and the innermost layer of reinforcement.	Although the tube of the sample in the condition "as received" had areas of delamination along the lap joint, no apparent additional damage occurred as a result of the simulated service flexing test.
D-1	Nitrile	Six plies of rayon tire cord fabric. In addition, the sample had a layer of square woven breaker fabric over the tube.	No apparent damage.
D-2	Nitrile	Six plies of rayon tire cord fabric.	No apparent damage.
G-1	Nitrile	Four plies of nylon tire cord fabric. In addition, the hose sample had a gum layer barrier compounded from neoprene between the tube and innermost layer of fabric reinforcement.	No apparent damage.
G-2	Nitrile	Six plies of rayon tire cord fabric.	No apparent damage.
H-3	Nitrile	Six plies of rayon tire cord fabric.	On the portion of the hose that was bent over the flexing rollers, delamination occurred at the lap joint of the tube material.
H-4	Nitrile	Four plies of nylon tire cord fabric.	On the portion of the hose that was bent over the flexing rollers, delamination occurred at the lap joint of the tube material. In addition, diametrically opposite the lap joint, delamination also occurred between the layers of the tube material.

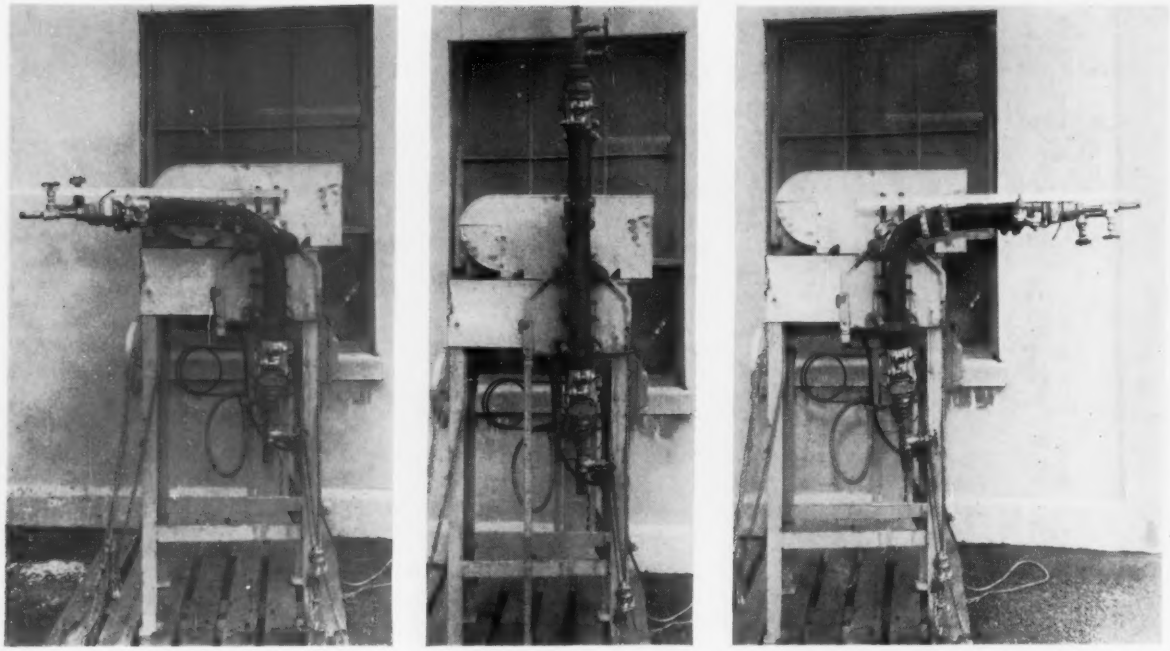

FIG. 1—Flexing machine with hose samples at different positions in the flexing cycle: (left) extreme left side of the cycle, (center) perpendicular position and (right) extreme right side of the cycle.

hose was again drained and then cut apart. The cut sections were examined visually for defects and were then used to prepare adhesive and tensile strength specimens.

Physical Properties of Hose Components

The adhesive strength of bond between the tube and carcass, between plies of carcass and between the cover and carcass were determined on four 1-inch wide specimens tested in accordance with Federal Test Method Standard No. 601 *(3)* except that strip-back instead of ring specimens were used. The adhesive strength tests were performed on specimens in the initial "as received" condition and following the simulated service flexing test. For the latter test condition the specimens were cut from that portion of the hose that had been located 2 inches above and 2 inches below the centerline of the flexing rollers. These tests were made within four to eight hours after draining the Type II fluid from the hose.

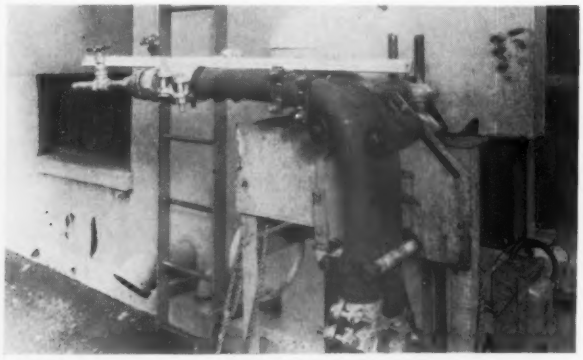

FIG. 2—Close-up of the flexing machine with hose samples at the extreme left position of the flexing cycle.

Tensile strength and elongation tests were made on specimens of the tube and cover materials in accordance with Methods 4111 and 4121, respectively, of Federal Test Method Standard No. 601 *(3)* after the following conditions:

(a) Initial, "as received."

(b) After immersing specimens in Type II fluid for 46 ± ¼ hours at room temperature. Calculations of tensile strength were based on the swollen area of the specimen as described in Method 6111 of Standard No. 601 *(3)*.

(c) After subjecting specimens to oxygen-bomb aging at a pressure of 300 ± 10 psi for 46 ± ¼ hours at 158° ± 2° F. as described in Method 7111 of Standard No. 601 *(3)*.

(d) After aging specimens of the cover material only for 100 hours in an accelerated light aging unit operated as described in Method 7311 of Standard No. 601 *(3)*.

(e) After the simulated service flexing test. The tension specimens prepared from the tube and cover materials were tested within 3 to 4 days after draining the Type II fluid from the hose.

The volume swell of the tube and cover materials was determined as described in Method 6211 of Standard No. 601 *(3)* following immersion of specimens in the Type II fluid for 46 ± ¼ hours at 74° ± 2° F. In addition, the per cent extraction of non-volatile matter and the presence of phosphate plasticizer in the tube material were determined in accordance with specification MIL-H-19091A *(1)*.

The elastomers used for the tube, friction and cover materials and the type of fabric used for the reinforcement were also identified.

Results and Evaluation

The dimensions of the hose, the thickness of the tube, carcass and cover materials, and the construction of the reinforcement are tabulated in Table I. The basic elastomeric ingredient used for the tube material, the construction of the reinforcement and the results of the simulated service flexing test are tabulated in Table II.

The average adhesive strength between the tube and carcass, between plies of the carcass and between the cover and carcass in the initial condition and following the simulated service flexing test are tabulated in Table III.

The elastomers used for compounding the tube, the tensile properties of the tube material after the various aging conditions, the volume swell, per cent extraction and presence of phosphate plasticizers are tabulated in Table IV. The elastomers used in compounding the cover and the tensile properties and volume swell of the cover material after the various aging conditions are tabulated in Table V.

Some of the hose samples were furnished with a sheet of fabric bonded to the bore of the tube, such as might be used to facilitate bleeding of air along the hose mandrel during vulcanization of the hose. Blisters and loss of adhesion occurred between this fabric layer and the tube material following the simulated service flexing test, as seen in Figure 3. Such deficiencies cannot be tolerated because portions of the fabric layer may be stripped loose during use of the hose in service and clog the valves and pipe lines aboard the receiving vessel.

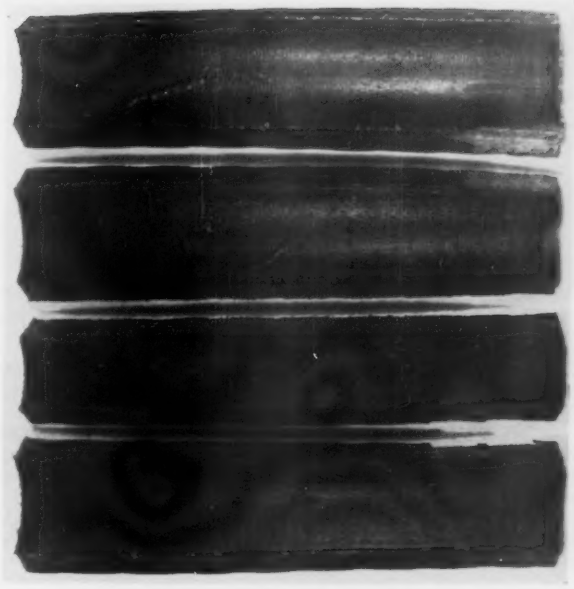

FIG. 3—Blisters on Code A-1 hose following the simulated service flexing test.

Several hose samples were badly distorted and exhibited poor adhesive strength between plies of reinforcement following the simulated service flexing test (Figure 4). Examination of these samples indicated that there was comparatively little frictioning material on and between the plies of reinforcement. Failure of these samples was apparently due either to use of insufficient frictioning material on and between the layers of fabric reinforcement or to an adverse effect on the hose components of Type II fluid that had permeated through the tube material.

The importance of good manufacturing techniques in the construction of refueling hose, such as a proper lap joint of the tube material, cannot be over-emphasized. As the tube is in direct contact with the fuel, a poor lap joint can accelerate delamination and permit permeation of the fuel through the tube, thus adversely affecting the bond between other hose components.

Better refueling hose can be developed by proper compounding of a tube material of adequate and uniform thickness, by the use of a gum barrier layer over the tube to prevent permeation of solvents and to develop a good bond to the carcass, and by providing a strong durable bond between the layers of frictioning material forming the carcass. In addition, the tube material in particular should be compounded to resist permeation through the tube wall and extraction by fuels pumped through the hose.

The results of the simulated service flexing test are tabulated in Table II in accordance with the type of elastomer used in compounding the tube material. As seen in this table, none of the ten samples having a tube compounded from neoprene exhibited delamination, whereas four of the eight samples compounded from nitrile rubber did show delamination. However, it should be noted that nitrile rubber is apparently less

TABLE III—ADHESION BETWEEN COMPONENTS OF HOSE MODELS

	Average Adhesion, pounds per inch of width					
	Initial Condition			After the Simulated Service Flexing Test		
Code	Tube to Carcass	Between Plies	Cover to Carcass	Tube to Carcass	Between Plies	Cover to Carcass
Specified in MIL-H-19091A	15 (min.)	15 (min.)	15 (min.)	——	——	——
A-1	21	36	36(4)	15	(2)	28(4)
A-2	26	37	22	15(4)	(2)	24(4)
A-4	37	35	27	19(4)	27	29
B-1	(1)	(1)	(1)	7	6	13
B-2	(1)	(1)	(1)	3(4)	<1	4(4)
B-3	(1)	(1)	(1)	5(4)	<1	6(4)
E-1	18	15	15	6	9	13
F-1	23	26	18	8	14	19
H-1	32	34	13	7	17	12
H-2	31	27	23	10(5)	13(3)	15
A-3	31	23	14	10	22	9
C-1	29	26	31	15	27	38
D-1	24	18	20	8	13	18
D-2	12	16	18	2	13	16
G-1	27	21	18	31	18	14
G-2	29	16	20	17	17	14
H-3	17	31	17	16	30	17
H-4	14	34	25	8(5)	27	24

(1) Insufficient material to make test; (2) Suitable specimens could not be prepared; (3) Adhesion between plies could not be determined as separation could not be made to occur at same ply-to-ply interface; (4) Separation occurred between the first and second plies adjacent to the cover and/or tube material; the adhesion of the cover or tube material to the ply exceeded this value; (5) Failure occurred due to the delamination of the tube material; the adhesion of the tube to the ply exceeded this value.

TABLE IV—PHYSICAL PROPERTIES OF TUBE MATERIALS

Code	Elastomer	Tensile Strength: Initial, psi	Tensile Strength: After Simulated Service Flexing Test, psi	Tensile Strength: After Oxygen Bomb Aging, Variation (%)	Tensile Strength: After Immersion In Type II Fluid, psi	Elongation: Initial, (%)	Elongation: After Simulated Service Flexing Test, (%)	Elongation: After Oxygen Bomb Aging, Variation (%)	Elongation: After Immersion In Type II Fluid, (%)	Volume Swell, (%)	Extraction, (%)	Presence of Phosphate Plasticizer
Specified in MIL-H-19091A	Neoprene or a Copolymer of Butadiene	1250 (min.)	——	± 25 (max.)	600 (min.)	300 (min.)	——	± 25 (max.)	150 (min.)	100 (max.)[2] 50 (max.)[3]	6 (max.)	None
A-1	Neoprene	1550	1520	(1)	780	420	420	(1)	230	100.4	3.3	Present
A-2	Neoprene	1000	1480	(1)	570	420	390	(1)	250	93.8	4.3	Present
A-4	Neoprene	1880	1440	—9	990	350	310	—11	210	59.5	4.9	None
B-1	Neoprene	(1)	2200	(1)	(1)	(1)	690	(1)	(1)	(1)	(1)	None
B-2	Neoprene	(1)	1730	(1)	(1)	(1)	650	(1)	(1)	(1)	(1)	None
B-3	Neoprene	(1)	1670	(1)	(1)	(1)	350	(1)	(1)	(1)	(1)	None
E-1	Neoprene	1730	1750	+6	630	560	500	+5	250	78.5	7.3	None
F-1	Neoprene	2100	1970	—2	1200	350	340	+3	220	93.5	7.5	None
H-1	Neoprene	2050	1880	—6	1130	320	340	+3	195	66.9	5.6	None
H-2	Neoprene	2000	1730	—8	1130	320	320	+3	195	66.8	5.6	None
A-3	Nitrile	960	1460	(1)	550	410	320	(1)	220	81.4	7.4	Present
C-1	Nitrile	1830	1460	—24	530	610	540	—15	260	38.9	7.4	None
D-1	Nitrile	1820	1700	—11	1020	320	340	+6	200	43.9	5.4	None
D-2	Nitrile	1810	1670	—8	1070	340	320	—3	210	44.8	5.3	None
G-1	Nitrile	2680	3340	—5	990	780	790	—1	760	22.6	7.9	Present
G-2	Nitrile	1710	1490	—4	1210	600	550	—8	410	50.1	5.0	None
H-3	Nitrile	1420	1430	+4	1140	310	310	—35	220	22.4	9.9	None
H-4	Nitrile	1450	1240	—9	1140	320	300	—3	230	23.1	9.3	None

(1) Insufficient material to complete tests; (2) Value for Class 1 material (neoprene); (3) Value for Class 2 material (nitrile).

TABLE V—PHYSICAL PROPERTIES OF COVER MATERIALS

Code	Elastomer	Tensile Strength: Initial, psi	Tensile Strength: After Simulated Service Flexing Test, psi	Tensile Strength: After Oxygen Bomb Aging, Variation (%)	Tensile Strength: After Immersion In Type II Fluid, psi	Tensile Strength: After Light Aging, Retention (%)	Elongation: Initial, (%)	Elongation: After Simulated Service Flexing Test, (%)	Elongation: After Oxygen Bomb Aging, Variation (%)	Elongation: After Immersion In Type II Fluid, (%)	Elongation: After Light Aging, Retention (%)	Volume Swell, (%)
Specified in MIL-H-19091A	Neoprene	1800 (min.)	——	± 25 (max.)	600 (min.)	75 (min.)	350 (min.)	——	± 25 (max.)	150 (min.)	——	100 (max.)
A-1	Neoprene	2200	1710	(1)	1290	(1)	390	300	(1)	250	(1)	84.5
A-2	Neoprene	1750	1840	(1)	1300	(1)	350	350	(1)	270	(1)	89.8
A-4	Neoprene	2260	2170	—7	760	99	400	430	+3	180	93	63.2
B-1	Neoprene	(1)	1690	(1)	(1)	(1)	(1)	440	(1)	(1)	(1)	(1)
B-2	Neoprene	(1)	2520	(1)	(1)	(1)	(1)	460	(1)	(1)	(1)	(1)
B-3	Neoprene	(1)	2470	(1)	(1)	(1)	(1)	420	(1)	(1)	(1)	(1)
E-1	Neoprene	1900	1670	—6	880	103	470	450	—6	220	77	67.0
F-1	Neoprene	1830	1820	+2	990	95	360	370	+11	230	85	80.5
H-1	Neoprene	1900	1980	—2	1040	80	380	390	+8	230	76	65.4
H-2	Neoprene	2030	1930	—7	1020	77	390	390	—2	215	77	68.2
A-3	Neoprene	1780	1840	(1)	1000	(1)	340	430	(1)	240	(1)	79.3
C-1	Neoprene	2320	2440	—52	1070	50	390	410	+20	190	85	68.7
D-1	Neoprene	2000	2170	—4	710	100	490	510	+1	250	88	73.2
D-2	Neoprene	2160	2220	—12	650	85	520	520	0	250	79	72.7
G-1	Neoprene	2350	2490	—8	770	110	410	400	—7	190	86	101.4
G-2	Neoprene	1720	1670	—10	970	90	420	430	—10	250	68	52.4
H-3	Neoprene	2040	1990	—5	1030	89	390	400	+8	240	85	65.7
H-4	Neoprene	2030	2000	—5	1120	83	390	420	+3	240	80	67.6

(1) Insufficient material to complete test.

permeable to fuels than neoprene as the adhesive strength between the remaining hose components was less deteriorated when nitrile rubber was used for the tube material than when neoprene was used.

Information received from other sources indicates that neoprene has superior cold flow properties in comparison with nitrile rubber. This property is significant as refueling hose is stored in a crimped position for long periods of time.

In the simulated service flexing test, deterioration of the hose samples was accelerated by a combination of flexing under dynamic conditions and the use of a test fuel. This flexing test caused blisters, delaminations and distortions in the hose models, and as noted in Table III, caused a significant decrease in the adhesive strength of bond between components of the hose. Although the investigation was made on 2-inch I.D. models of refueling hose, significant deficiencies in the construction of refueling hose have been discovered. Thus, the simulated service flexing test appears to be suitable as a screening test to evaluate new components and constructions of refueling hose.

The tensile properties of the tube and cover materials were not significantly affected by the simulated service flexing test. This is probably due to the fact that any absorbed Type II fuel evaporated prior to the time the specimens were tested.

Conclusions

All elastomeric components of the hose should be compounded to have maximum resistance to permeation by fuels and to extraction of essential ingredients therefrom.

The components of the hose should be constructed and bonded together to resist the deteriorating effects of flexing and aging.

The use of neoprene is mandatory for compounding the cover of refueling hose; the tube may be either a neoprene or a nitrile rubber stock. However, if the tube is made of nitrile rubber, then it should be lightly loaded in order to develop adequate adhesive strength between layers.

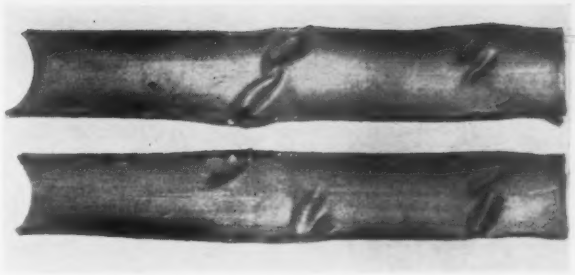

FIG. 4—Poor adhesion between plies and distorted condition of Code B-1 hose following the simulated service flexing test.

A desirable feature for lightweight refueling hose is the inclusion of a gum barrier layer of nitrile rubber between the tube and carcass to develop a good bond between these components and to prevent permeation of fuels through the hose.

The simulated service flexing test appears to be an inexpensive accelerated method for evaluating the relative suitability of new materials and construction of refueling hose. However, in the final analysis, the suitability of refueling hose for Naval usage can be determined only by actual service tests on the complete lengths of hose.

ACKNOWLEDGMENT

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LITERATURE REFERENCES

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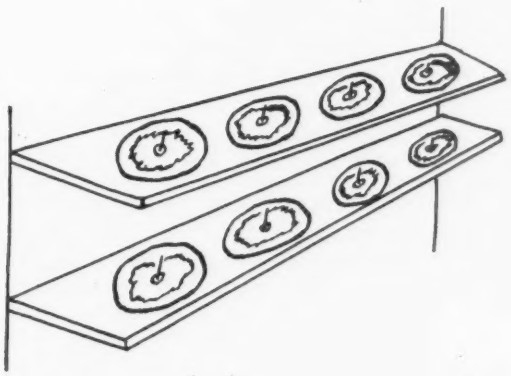
(2) Specification MIL-S-3136A of October 3, 1956, Standard Test Fluids, Hydrocarbon and Iso-octane.

(3) Federal Test Method Standard No. 601 of April 12, 1955, Rubber: Sampling and Testing.

An Efficient Method of Handling Recording Charts



THE way that one plant handles the filing of its recording charts is shown in the accompanying sketch. Two shelves are arranged as indicated, slightly sloping, and at a convenient height for easy inspection and reading. There are eight recorders in the plant, and a corresponding peg for each of them. Each peg is clearly marked, so that the charts from a recorder are always placed on its own peg. The latest charts are kept on top. The shelves are amply wide and the pegs spaced so that there is plenty of clearance and no overlapping. Charts covering a full week of operation are always kept on the pegs, previous ones being systematically filed away for reference at any time. This system has proved of great value in keeping the records readily available. W. F. S.

Editorials..

The Hot Dog Vendor

► A kind reader, in commenting on our editorial in the January, 1958, issue of RUBBER AGE, has sent along a fable which appeared in an advertisement in a recent issue of the *Wall Street Journal*. Not only is the little tale amusing, but it parallels our sentiments precisely. Entitled "A Man Lived by the Side of the Road—and Sold Hot Dogs", the story goes like this: "He was hard of hearing, so he had no radio . . . He had trouble with his eyes, so he had no newspaper . . . But he sold good hot dogs . . . He put up a sign on the highway telling how good they were . . . He stood by the side of the road and cried, 'Buy a hot dog, mister' . . . And people bought . . . He increased his meat and bun orders and he bought a bigger stove to take care of his trade . . . He got his son home from college to help him . . . But then something happened . . . His son said, 'Father, haven't you been listening to the radio? There's a big depression going on . . . The international situation is terrible, and the domestic situation is even worse' . . . Whereupon the father thought, 'Well, my son has been to college . . . He listens to the radio and reads the papers, so he ought to know' . . . So the father cut down on the bun order, took down his advertising sign and no longer bothered to stand on the highway to sell hot dogs . . . Hot dog sales fell almost overnight . . . 'You are right, son,' said the father to the boy . . . 'We are certainly in the middle of a great depression'."

Fundamental Research

► Basic scientific research, never adequately supported in the United States, is likely to be glutted with money as a result of the implications of the Soviet satellite program. Overnight, the starved status of basic research has become a public issue. The National Science Foundation, the sole government agency for the promotion of fundamental research, seems certain, for the first time in its seven-year history, to obtain from the Administration and from Congress all the money it wants. Basic research is the quest for new knowledge. It involves slow and laborious methods of observation, hypothesis, deduction and experimental verification. New truths obtained from such investigation will be the basis of many major technological advances. But the evolution of new products and new weapons from this knowledge may take years of applied research and engineering.

The sudden awareness that this country may have a shortage of the scientific brainpower required for an increased effort in basic research has already produced major developments. The National Science Foundation, for example, will seek to triple its research grants. The Administration is considering a $200,000,000 to $250,000,000 program of grants to the States to stimulate education, particularly in science and mathematics. The Defense Department has set up a new office — the Advance Research Projects Agency — where scientists and engineers will have greater freedom to explore ideas for weapons. The State Department is considering the restoration of science attachés to the foreign service. The Commerce Department is establishing a central clearing house for translating and distributing Soviet scientific reports.

Many in the industry have long been of the opinion that the rubber industry should have started its own centralized basic research organization some time ago. In the light of current events, the time may be now—both as a contribution to national defense and as a stimulus to the industry itself. From time-to-time in these columns we have suggested the establishment of a rubber industry research center aimed at solving basic research problems as well as the development of new fields of endeavor. The rubber industry, as a whole, suffers from several basic research defects. For example, vulcanization. Here is a process which we employ daily and still very little is known of the manner in which it operates. We are ignorant of the "why" of cause and effect and are thereby limited in our technological expansion.

This is but one of the fields to which a basic research center could lend its services. There are, of course, many others. That there are problems involved in the establishment of such a research center is obvious. The question of financing comes to mind. The question of free competition also suggests itself. These are not insoluble. There are many technical organizations to which the rubber industry lends its solid support. The free interchange of ideas strengthens the industry.

The present time seems most opportune for the consideration of this proposal. Individuals and companies are today more receptive to this idea of basic research, recognizing that the scientific investigations of today bring dollar returns in the not too distant future. We would emphasize here, however, that what is proposed is basic research only—not product research.

It should be remembered that the search for scientists and engineers will become increasingly more intensive. Any research center will only be as good as its staff. In order to attract properly qualified personnel to a rubber industry research center it is incumbent upon us to make our plans now—to raise the money—select the site—hire the personnel—choose the projects. There is much to be done and the quicker we bend to the task the better. We would value the comments and suggestions of our readers. We intend to have more to say on this subject at a future date and readers' opinions will be most helpful.

Are you writing off increasing operating expenses

to the general rise in the cost of living?

If so, you might be wise to note

what this report has to say on

Profits and Overhead in the Rubber Industry

THE total dollar amount spent by companies in the rubber industry for selling, general and administrative expenses has increased steadily each year from about $583 million in 1951 to $874 million in 1956. This is an increase of 50% in these expenses during a period when annual dollar sales increased 18% from $5,238 million in 1951 to $6,204 million in 1956.

These facts were revealed by a study made for RUBBER AGE by Judson F. H. Turton and Edgar C. Bleick of the management counseling firm of Turton Associates, Inc., Cleveland, Ohio. The figures are backed by over six months of research by the staff of the firm, which has served the top managements of many outstanding industrial companies.

The increase in selling, general and administrative expenses has had a direct effect on the operating earnings of the industry. In 1951, the average of those costs for the industry was 11.1% of sales, and operating profits amounted to 11.9% of sales. By 1956, the selling, general and administrative expenses had increased to 14.0% of sales, a rise amounting to 2.9% of total sales. Significantly, operating profits declined to 9.0% of sales in 1956, a reduction of 2.9% since 1951 in the ratio to total sales. These figures are shown in tabular form in Table I.

Selling, general and administrative expenses have increased 50% during a period when annual dollar sales have increased only 18%—with a direct effect on the operating earnings of the industry.

Costs of goods sold, which are basically the manufacturing costs of the companies, have not varied significantly from year to year and have maintained approximately the same relation to sales throughout the entire period. In both 1951 and 1956, these costs were 77.0% of total dollar sales of the industry. This is still by far the largest element in total costs, but has not had the same direct constricting effect on operating earnings in recent years as has the increase in selling, general and administrative costs.

Effects of Profits

Possibly one reason the steady increase in selling, general and administrative expenses experienced by most companies in the industry has not attracted more attention is the fact that net profits of the industry increased during this period due to the elimination of the excess profits taxes which applied in 1951 through 1953. Unfortunately, any similar reduction in Federal income taxes in the next few years which would furnish a like boost to net profits seem unlikely.

This information on operating profits and expenses is given in greater detail in Table II, which is an example of the analyses prepared periodically by Turton Associates. The figures are based on quarterly totals for all companies in the industry compiled by the Securities and Exchange Commission and the Federal Trade Commission. The division of operating expenses into "Cost of Goods Sold" and "Selling, General and Administrative Expenses" was developed by the SEC and FTC for 1952 and 1953. Distribution of these expenses in other years is based on the consolidated results derived from published operating reports of representative companies that together conformed to the industry percentages in 1952 and 1953.

Had selling, general and administrative expenses of the industry been at 11.1% of sales in 1956 as in 1951, the 1956 operating profits would have been increased by $185 million. After Federal income taxes, the rise in net profits of the industry would have been $88 million or a 32% increase over the $276 million net profits actually earned in 1956. A potential stretching of profits of that magnitude is worthy of the time and effort of the top managements of each company to thoroughly review this area of expense.

TABLE I—RUBBER INDUSTRY SALES, EXPENSES AND PROFITS FOR 1951 AND 1956

	1951		1956	
	Sales (%)	Dollars (Millions)	Dollars (Millions)	Sales (%)
Sales	100.0	$5,238	$6,204	100.0
Cost of Goods Sold	77.0	$4,028	$4,771	77.0
Selling, etc., Expenses	11.1	583	874	14.0
Total Operating Expenses	88.1	4,611	5,645	91.0
Operating Profits	11.9%	$ 627	$ 559	9.0%

A significant factor in increased operating costs is found in the ineffectiveness that accompanies efforts within inadequate or outgrown organization structures.

It is significant that while increases in selling, general and administrative expenses have been characteristic of every manufacturing industry in recent years, there are representative companies that have given close and realistic attention to these expenses and actually reduced their percentage to sales as volume increased, thereby going counter to the trend in their respective industries. These companies invariably have effective organization structures with definitely assigned authorities and responsibilities, and realistic measurements and aids to assist in the achievement of company, departmental and individual objectives and assignments.

The steady increase in selling, general and administrative expenses of the industry in recent years, regardless of sales trends, indicates the tenacious nature of these costs. This further emphasizes the advisability of appropriate action in these areas of operation with respect to policies, organization structure, practices, controls and other important considerations.

Influence of Costs

There has been some tendency to excuse the increases in selling, general and administrative expenses without thorough investigation, on the general basis that they have their origin in the rising cost of living which has forced higher salaries for salesmen, clerical and executive personnel. Similarly, higher costs of services have been offered as an explanation. Such consideration seems to overlook the fact that the dollar sales volume has also been affected by inflationary forces and that therefore these costs could be expected to maintain a fairly comparable relation to sales in each year.

The general inclination in many companies has been to attribute these increased costs primarily to the fact that there is more competition for available business now than there was six years ago. While this is undoubtedly an important factor, selling, general and administrative costs of the rubber industry rose steadily from 11.1% of sales in 1951, to 12.7% in 1952, and to 13.1% in 1953 during the period of the Korean War when there was generally little increase in sales efforts. The experience of the rubber industry during these years parallels closely the results felt in other industries in the expansion of these costs as a per cent of sales.

Experience of companies in a variety of industries has indicated, however, that there is often a more significant factor that influences these increased costs. This is found in the ineffectiveness that often accompanies the efforts of both executive and other personnel when they are forced by circumstances to work within inadequate or outgrown organization structures. As volume expands, this condition becomes more critical rather than being relieved. Some of the indications of inadequate organization structure are found in:

(a) The increasing number of administrative layers in a company, which further complicate and deter good communications, make it difficult for executives to know what is going on even in their own departments, and handicap the job of attaining necessary coordination and team work between departments and other units of the company.

(b) A mounting load of paper work on executives, which not only saps their energies, but takes time that should be devoted to necessary executive activities such as the development of plans for present and future action and the provision of leadership to subordinates so that they will successfully carry out these plans.

(c) A lack or inadequate delegation of definite written authorities and responsibilities to subordinates, resulting in the utilization of an unnecessarily large amount of executive time on decisions regarding operating details that could be handled as well or better by others. The effect is to limit the growth and capabilities of subordinates, and to make it difficult or impossible adequately to appraise their performance or to choose those who have proven themselves best qualified for positions of responsibility.

(d) The increased use of "assistants" and "committees" to support executives who are loaded with more responsibilities and details than they can adequately administer independently.

(e) The growth of internal politics and "empire building" within the company, which are certain to have a direct and apparent effect on costs.

A Need for Action

The primary emphasis in most industries since the start of World War II, whether we realize it or not, has been on problems of production in order to meet the tremendous expanding and varied requirements for defense purposes, the automotive markets and the industrial and home economies. There just does not appear to have been enough time available to executives in many companies to keep on top of every activity. As a result some functions and costs have gotten out of line. On the basis of the comparisons over a period of years noted in this report, selling, general and administrative expenses appear to be such costs.

Historical comparisons appear to have lost their value as a basis of control of these costs except that they may point up general problem areas. They can be used as a basis for corrective action only to the extent that it is known that these activities were carried on as effectively as they should have been in prior years, and then only if there has been no major change in the nature of the activity during the intervening period. In those companies where control appears to have been exercised most effectively, corrective action has been preceded by objective analysis of conditions underlying the costs and determination of the realistic requirements which are needed to meet competitive pressures.

The knowledge, experience, objectivity, available time, and the will to analyze the situation and develop an appropriate program of action is required if rubber companies are to make certain that their dollars spent for selling, general and administrative expenses are fully productive and kept within reasonable limits.

TABLE II—OPERATING SALES, EXPENSES AND PROFITS IN THE RUBBER INDUSTRY IN MILLIONS OF DOLLARS, 1951 THROUGH 1956

	1951	1952	1953	1954	1955	1956	Change 1951-1956
Sales	$5,238	$5,233	$5,411	$4,952	$6,056	$6,204	$+ 966
Cost of Goods Sold	4,028	4,069	4,214	3,833	4,702	4,771	+ 743
Selling, General and Administrative Expenses	583	669	712	720	790	874	+ 291
Total Operating Expenses	4,611	4,738	4,926	4,553	5,492	5,645	+1,034
Operating Profit	$ 627	$ 495	$ 485	$ 399	$ 564	$ 559	$— 68
Income Taxes and Miscellaneous Expenses	391	304	280	199	296	283	— 108
Net Profit	$ 236	$ 191	$ 205	$ 200	$ 268	$ 276	$+ 40

News Reports and Industry Activities

RUBBER AGE, FEBRUARY, 1958

Goodyear Completes Large New Pilot Facility for Natsyn

► Production of "Natsyn", a new type synthetic rubber which has the molecular structure and performance characteristics of the natural tree-grown product, has moved from small batch laboratory scale to a tonnage basis with completion of a large new pilot plant by the Goodyear Tire & Rubber Co. Development of a "synthetic natural rubber" and ability to produce it in quantity is a major step forward to meet a threatening world-wide shortage of natural rubber which has been forecast for 1960 and thereafter, said Russell DeYoung, executive vice-president in charge of production.

Goodyear's highly instrumented pilot plant, built at a cost of approximately three quarters of a million dollars and designed exclusively for the production of Natsyn, has a tonnage capacity which will enable extensive production scale tire building and evaluation trials. This accomplishment opens the door to early further expansion in this field, Mr. DeYoung said. Goodyear expects soon to undertake the engineering of a full scale Natsyn production plant with 25,000 to 30,000 tons annual capacity.

Ability to produce such a rubber reduces any threat to the nation's important trucking industry should natural rubber supplies from overseas plantations be cut off as they were during World War II, declared Mr. DeYoung. It further provides a buffer against runaway natural rubber prices such as have occurred in the past. In certain large scale uses of rubber—heavy duty tires for trucks, buses, airplanes and earth-moving equipment where high heat buildup is a factor—present day synthetic rubbers have not proved satisfactory. Only natural rubber, or a duplicate such as Natsyn, has the necessary physical characteristics for satisfactory performance in these uses.

Since there is no practical way by which the output of natural or tree-grown rubber can be increased within the available time, and since political unrest in the Far East may tend to decrease output, production of a "synthetic natural rubber" is of the highest importance to the American economy and that of the entire free world, Mr. DeYoung said. In a recent coast-to-coast highway test conducted by Goodyear, heavy duty truck tires built entirely of Natsyn measured up to the performance of natural rubber tires in general durability and in most other gauges of performance.

Goodyear scientists first had success in making a "synthetic natural rubber" with the dynamic properties of the tree-grown product in 1955. Until now, production had been on a small batch laboratory scale. Full commercial scale production of Natsyn depends upon the availability of isoprene, a petroleum derivative from which the "synthetic natural rubber" is made. At present, the supply of isoprene is inadequate, with only one commercial producer in the United States. Potential producers, however, appear to have the development processes for making a low-cost, high purity product well under way.

Natsyn is made from the same basic molecule of isoprene that is found in the rubber tree. The big difference between man-made rubber and the tree variety is that of speed and efficiency by which the rubber is produced. Whereas the rubber tree requires about seven years from planting before it produces rubber latex, Natsyn can be polymerized in a matter of hours. Highly purified isoprene and solvents are pumped from storage tanks outside the pilot plant into an additional purification system within the plant. Following this step, these ingredients are carefully measured in proper proportions in weigh tanks and then charged into reactors with a catalyst.

After polymerization has taken place, the Natsyn, in the form of a thick viscous material, is drawn from the reactor. Then, through a unique drying process, unreacted isoprene and solvents are removed, leaving the "synthetic natural rubber" in crumb form, ready for baling. From this point, Natsyn is handled, compounded, processed and built into tires in exactly the same manner as natural tree-grown rubber, and with all the inherent properties and characteristics of natural rubber, company officials point out.

Weedkiller Raises Latex Yield

► Latex yields have been raised as much as 25 to 40 per cent through the use of a chemical often employed as a weedkiller by gardeners, according to a report issued by the U. S. Rubber Co., New York, N. Y. Known as "2-4-D", this chemical has been tested by U. S. Rubber on its rubber plantations in Malaya and Indonesia for the past five years as a hormone or growth stimulant. According to the company, the chemical has not only raised yields, but has also rejuvenated older trees and added years to their productive life. Less than an ounce of the chemical is used on a tree. Mixed with brown, syrupy palm oil, it is painted on a narrow section of the trunk from which the bark has been peeled away. The oil is a carrier for the chemical, which is absorbed into the system of the tree.

Advisory Committee Reports on U.S. Stockpile Program

► A Government Advisory Committee has recommended the cautious disposal of some items in the nation's $7 billion stockpile of raw materials designed to support military production in a future war. The Government's present supplies of many raw materials exceed requirements that have been lowered by the switch to missile-type war planning the committee said. It proposed excessive supplies of perishable goods such as rubber and many materials that don't meet specifications should be sold, but only when this can be done "without unduly interfering with usual markets." Present laws, it added, should be changed to give the Government more flexibility in disposing of excess stocks.

The advisers urged the Government to keep all present supplies of minerals and metals, even if they exceed requirements, provided the materials are commercially usable.

Office of Defense Mobilization Director Gordon Gray made public the recommendations of the 12-man group, headed by Holman D. Pettibone, chairman of Chicago Title & Trust Co. The group was appointed last fall to reappraise the nation's stockpiling needs in view of the country's vulnerability to direct attack.

At the same time, the special study group urged much more effort by state and local governments and key industries—with Federal help, if necessary—to store medical supplies, construction and transportation equipment needed to help the U.S. population survive a nuclear attack.

Mr. Gray said he will seek the views of Federal agencies involved in stockpiling programs before taking any action on the recommendations. These would include the Defense, State, Interior and Agriculture Departments and the Federal Civil Defense administration.

Noting that any nuclear attack on the U.S. would bring "major loss of life and devastation," the committee concluded there is "an immediate and urgent need for programs for human survival."

"The Government is now spending $40 billion a year on the military forces," the report said. "It has already accumulated about $7,350,000,000 worth of strategic and critical materials. The time has come to take action for human survival, relief and rehabilitation in event of nuclear attack."

Forms Chemical Division

► Vickers Petroleum Co., Inc., Wichita, Kansas, has announced the formation of the Vickers Chemical Division, which will operate in conjunction with the $2,500,000 Udex extraction unit now in final phases of construction at the firm's Potwin, Kansas, refinery. The BTX petrochemical plant is said to be the first to be constructed by an oil company in Kansas. A part of the company's diversification program, the new division is expected to provide stimulation for even further diversification after the Udex extraction unit goes on stream in April. Vickers Chemical Division will be solely responsible for the sales and distribution of benzene, toluene, xylene and other aromatic solvents. Additional products are under consideration and will be announced when these products are determined ready for market.

William K. Jackson, former director of the Chemical Division for Cosden Petroleum Co., has been named vice-president of research and development and technical assistant to the president, J. A. Vickers, for the new unit. Arthur B. Mullaly, previously president of Advance Solvents and Chemical Co., has been appointed vice-president in charge of marketing and market development. Dewey Mark, who was chemical sales manager for Cosden Petroleum Co., has been appointed general sales manager of the division. Richard J. Boushka, associated with Vickers since 1956 with the exception of a leave of absence for Air Force Duty, has been appointed sales coordinator for the new division.

Detroit Offers Laboratory Course

► The Department of Chemical Engineering of Wayne State University, Detroit, Mich., in cooperation with the Detroit Rubber and Plastics Group, is now offering a new rubber technology laboratory course. Called "Rubber Technology III", the course is designed to provide 16 weekly meetings of three hours each, including a one-half hour discussion and two and a one-half hours of laboratory work. All sessions are held in the Engineering Building at Wayne State. The course began on Wednesday evening, February 12, at 7:00 p.m. and will continue on subsequent Wednesdays. A fee of $50.00 per student is charged. The general purpose elastomers, both natural rubber and butadiene-styrene types, are to be discussed during the first half of the course, while the second half will consider the specialty rubbers.

Alderfer Licenses English Firm

► Lintafoam Co., Loudwater, England, has been licensed to manufacture "Foamedge" products by the Sterling Alderfer Co., Akron, Ohio. Foamedge is the trade name of a group of polyurethane foam products for home and auto use. Foamedge machinery for Lintafoam is now under construction in Akron. Production is expected to start in early spring. It is also reported, that negotiations are underway for licensing Foamedge manufacture in several other countries.

Charles H. Rybolt

Named Chemical Divisions Director

► Charles H. Rybolt has been appointed director of the Chemical Divisions of Wallace & Tiernan, Inc., Belleville, N. J., while retaining his present position as general manager of the Lucidol Division at Buffalo, N. Y. Mr. Rybolt joined Wallace & Tiernan in 1941 as a sales engineer in the company's Equipment Division selling chlorination and chemical feeding equipment. In 1943, he was appointed assistant superintendent of chemical manufacturing at the Belleville, N. J., plant. Mr. Rybolt was transferred to the company's Lucidol Division in 1946 as sales manager and was appointed general manager of the division in 1954. He is a member of the American Chemical Society and the Society of Plastics Industry.

Buys Sun Stearate Department

► Witco Chemical Co., New York, N. Y., has announced the acquisition of the Stearate Department of the Sun Chemical Co. The new acquisition will provide Witco with production facilities for metallic stearate in four separate locations in the U. S. as well as one in Canada. Joseph L. Kearns, formerly sales manager of Sun's Stearate Department has joined Witco in a similar capacity and will have direct supervision of the new stearate operation. Mr. Kearns will make his headquarters in Witco's executive offices in New York City. A graduate of Bucknell College, with a B.S. degree in chemistry, Mr. Kearns was a captain in the Air Corps during World War II. Since then, he has been active in selling organic chemicals. Mr. Kearns is a member of SACCE and the American Management Association. Existing personnel will continue to operate the stearate plant at Wood River Junction, R. I.

Builds Polyvinyl Chloride Unit

► Atlantic Tubing and Rubber Co. is constructing a new polyvinyl chloride unit at its site in Cranston, R. I. This is the sixth PVC project designed and constructed in the United States by Scientific Design, New York, N. Y. It is estimated that the new plant has a potential capacity of about 12 million pounds a year.

Ohio Rubber Promotions

► Ohio Rubber Co., Willoughby, Ohio, has announced the appointment of Richard L. Halstead as manager of continuous molding sales and C. A. Matz as manager of tire and farm equipment sales. Mr. Halstead started with the company four years ago as development engineer and was product manager previous to his new appointment. A native of Wellston, Mich., he attended the Michigan State University and the Detroit Institute of Technology and holds a bachelor of science degree in chemistry. At Ohio Rubber, Mr. Halstead is a member of the National Management Association and the Orco Golf League. He is also a member of the Detroit Rubber & Plastics Fraternal Group, the American Chemical Society and the Knights of Columbus, Willoughby Council.

Mr. Matz started at Ohio Rubber in the Specification Department in 1938 and later was put in charge of waste control. At the time of his promotion, he was supervisor of tire and track engineering. During World War II, Mr. Matz established numerous sources to manufacture tank track components for the company and was also loaned to the government for several months to serve in a similar capacity. At present, he represents the company on various committees pertaining to tank track development and testing. He is a member of the National Management Association, the American Ordnance Association and several community organizations.

Morningstar and Paisley Merge

► Morningstar, Nicol, Inc., and its subsidiary Paisley Products, Inc., both of New York City, have been merged to form a single corporation called Morningstar-Paisley, Inc. Also absorbed into the new corporation are several subsidiaries including Haberland Manufacturing Co. and Federal Adhesives Corp., both of which were acquired last fall. Hayes Adhesive Co., St. Louis, Mo., and Aroostook Potato Products, Inc., Houlton, Maine, will continue as separate subsidiary corporations. The company believes that the simplification of corporate structure will strengthen the organization by integrating and coordinating activities in the manufacturing, research and development, sales, advertising and financial divisions of the company. Several West Coast subsidiaries of Morningstar and Paisley have been absorbed into Morningstar-Paisley, Inc., of California.

Rubber Stockpile Acquired

► George Woloch Co., Inc., New York, N. Y., scrap rubber brokers, have purchased the entire stockpile of the former Pequanoc Rubber Co. from the parent concern, American Hard Rubber Co. The sale included 18 million pounds of scrap rubber in one of the largest transactions of this type ever made. The stockpile consisted of several thousand tons of tires as well as miscellaneous grades. The Woloch Co. is offering this material to various reclaimers throughout the world.

AIEE Rubber Subcommittee Plans Two-Day Conference

► The Rubber and Plastics Industries Subcommittee of the General Industries Application Committee, American Institute of Electrical Engineers, will hold a two-day conference on "Electrical Engineering Problems in the Rubber and Plastics Industries" at the Mayflower Hotel in Akron, Ohio, on April 14 and 15. This will be the ninth conference held on this subject. A tentative program has now been set for the meeting. The keynote address will be delivered by R. A. Jay, director of engineering for the Goodyear Tire & Rubber Co.

The first paper to be presented at the morning session on April 14 will be "A Static-Magnetic Adjustable Speed Motor Controller" by D. A. Baker (Cutler-Hammer). This will be followed by a paper on "Precision Speed Matching for Calender and Train Drives" by P. R. Gravenstreter and W. A. Shelton (Clark Controller).

Following a luncheon recess, Allen D. Bloomberg (Monsanto Chemical), will present a paper on "Automatic Bulk Conveying of Plastic Materials with Air." Next, Leo Willmott (Willmott Electric), will deliver a paper on "Tread Conveyor System".

Activities on April 14 will conclude with a cocktail hour and a banquet which will be addressed by Dr. Norman P. Auburn, president of the University of Akron. Dr. Auburn will speak on "Soviet Higher Education—Threat or Promise."

The program on April 15 will get underway with a paper on "Electronic Weighing in Material Handling Applications" by V. C. Kennedy, Jr. (Streeter-Amet). R. N. Johnson and W. F. and John Barnes will next speak on "An Automated Warehousing Installation."

Following the luncheon recess, the program will continue with a paper on "Aids in Trouble Shooting" by John Sutton (Goodrich). The meeting will conclude with the presentation of subcommittee reports. The first of these, "Problems Due to Atmospheric Contamination", will be presented by N. A. Williams (Goodyear), while the second, "Standardization for the Rubber and Plastics Industries" will be presented by W. S. Watkins (Ohio Rubber).

Producing 98% Ethylene Diamine

► Organic Chemicals Division of Olin Mathieson Chemical Corp., New York City, has announced that commercial output of 98 per cent ethylene diamine is now underway. Company officials stated the desire for a more concentrated product by many ethylene diamine consumers has resulted in the addition of the 98 per cent material to the Organic Chemicals Division line. 85-88 per cent and 90-93 per cent of ethylene diamine will still be produced. No change is anticipated in the availability of polyamines 333 and 910. Olin Mathieson's newly organized Organic Chemicals Division will market ethylene diamine and polyamines formerly handled by the Industrial Chemicals Division.

Wells

Neff

Sewall

Johnson

Minnesota Rubber Company Elects Four New Vice-Presidents

► Four executives of the Minnesota Rubber Co. have been elected vice-presidents of the Minneapolis, Minn., corporation according to Robert W. Carlson, president. The new company officers are Robert R. Johnson, vice-president, engineering; E. Burke Neff, vice-president, quality and cost control; Loren J. Sewall, vice-president, manufacturing, and Richard G. Wells, vice-president and director of sales. The promotions follow a recent corporate reorganization in which the firm's four subsidiaries were integrated in the parent company and given divisional status. The new vice-presidents will have responsibility in their respective assignments for both the parent company and its four divisions: Silicone Rubber Division, Plastics and Latex Division, Rainbow Rubber Division, Tool and Die Division and the Research and Development Division.

Mr. Johnson has been chief engineer of Minnesota Rubber for the past two years. An engineer with broad experience in design of tools and related equipment, he was formerly general manager of Master Tools, Inc., now the Tool and Die Division of Minnesota Rubber.

Mr. Neff, a business administration graduate of the University of Minnesota, was formerly vice-president and general manager of Minnesota Silicone Rubber, Inc., a subsidiary specializing in precision molded silicone rubber parts widely used in electrical and electronic equipment.

Mr. Sewall is one of the senior Minnesota Rubber employees in point of service. After holding a number of supervisory positions in engineering and production departments, he became factory superintendent in 1955, a position he held until his present promotion.

Mr. Wells was district sales manager for Minnesota Rubber in the New York City trade area prior to his appointment as general sales manager in 1955. In the latter capacity, he has been responsible for the administration of the company's nationwide sales organization. He is a graduate of Dartmouth college.

Named Regional Sales Manager

► Industrial Chemicals Division of the Pittsburgh Coke & Chemical Co., Pittsburgh, Penna., has named Edward H. Winkleman eastern regional sales manager. Mr. Winkleman will be in charge of the company's industrial chemical sales in the New England states, New York, New Jersey, eastern Pennsylvania, Virginia, Delaware and Maryland. His headquarters will be at the company's regional sales office in New York City. Formerly a sales representative for the division, Mr. Winkleman joined Pittsburgh Coke & Chemical in 1954. He had previously been associated with the United States Testing Co. and Rockefeller Center, Inc. Mr. Winkleman is an active member of the Salesman's Association of the Chemical Industry.

Pirelli Granted Ripple License

► Pirelli, Societa Per Azioni, largest rubber company in Italy, has been granted an exclusive license by the Ripple Sole Corp., Detroit, Mich., to make, use and sell "Ripple" soles in Italy. Negotiations were started between the two firms last summer.

General Builds Retread Network

► General Tire & Rubber Co., Akron, Ohio, has announced the creation of a multi-million dollar nationwide network of giant tire retread plants. Involving mostly new construction, the network was built and formed at a cost of nearly $3 millon. It consists of seven plants located at Charlotte, N. C.; East Rutherford, N. J.; Kansas City, Mo.; Boise, Idaho; Corpus Christi, Texas; Los Angeles, Calif., and Akron, Ohio. The East Rutherford and Los Angeles plants are still under construction. The latter, entailing the largest single expenditure, includes facilities both for the production of tread rubber and the retreading of giant tires. The company says that a major factor in its decision to organize the network was the construction of the new 40,000 mile federal road system with its great and growing requirements for off-the-road tires and retreading services. General's chain of retread plants will provide uniform factory-controlled repair and retread services on giant tires and will be capable of handling the biggest tires produced. The company's Kraft system of recapping will be used exclusively.

Taylor Appoints Vice-Presidents

► Taylor Instrument Companies, Rochester, N. Y., have announced the appointment of six vice-presidents, including L. Laurence Forward, Nathaniel B. Nichols, Marc E. Porter, William M. Walters, Karl H. Hubbard and Frank S. Ward. Mr. Forward, vice-president and general sales manager, was manager of the company's Chicago branch until 1956. He joined the company in 1930. Mr. Nichols will serve as vice-president and also as chief engineer. In addition to his Taylor experience, he has also served as professor of electrical engineering at the University of Minnesota, an officer of the Raytheon Manufacturing Co. and a group leader in the Fire Control Division of the Radiation Laboratory of M. I. T.

Mr. Porter, a director and member of the executive committee, is also treasurer of Taylor. He joined the company in 1934 after completing academic work in accounting and business administration. Mr. Walters, who is also a director and member of the executive committee, will continue as head of all Taylor manufacturing. He has been with the firm since 1936. Mr. Hubbard, who becomes a vice-president with responsibility in research, has been associated with the organization since 1928. Mr. Ward, member of the board and executive committee, becomes vice-president and administrative assistant to the president. Formerly general sales manager, he has been with the company for forty years.

Boston Offers Rubber Course

► Northeastern University, in cooperation with the Boston Rubber Group, is now offering a course in rubber technology covering principles and practice. Rubber Technology II concerns itself with the relationship of polymer structure to properties, and how these structural characteristics can be used to advantage by the rubber compounder. Five major problems in areas of rubber manufacture such as footwear, wire and cable, and molded products will be covered by guest lecturers. Applicants for the course, which began on February 3, had to have either a B. S. degree in chemistry or have completed Rubber Technology I. Charles B. Griffis, Chief of the Rubber Technology Section of the Quartermaster Research and Development Command, Natick, Mass., is instructor of the course. A fee of $40.00 per student, including the registration fee, was charged.

Muscle Shoals Expands

► Muscle Schoals Rubber Co., Inc., Sheffield, Ala., has announced that the firm is presently undergoing expansion in both operations and facilities. An addition to the firm's plant will house two mixing mills and provide more storage for raw materials. When the company moved into its present building, constructed in the fall of 1954, it operated three molding presses. It has since expanded to a seven press operation and expects to add more presses during 1958.

George J. Piaskowy

Named Sales Representative

► George J. Piaskowy has been appointed sales representative for the C. P. Hall Co. of Illinois, Chicago, Ill. A chemistry major at Wright College, Mr. Piaskowy has worked with Dryden Rubber Division of Sheller Manufacturing Co., Acadia Synthetic Products Division of Western Felt Works, and was employed as research chemist at Mystic Adhesives, Inc. Mr. Piaskowy will handle the sales of rubber chemicals in Indiana, Illinois, Iowa, Missouri, and Nebraska.

Reorganizes Chemical Activities

► The expanded and diversified chemical activities of the Borden Co. have been organized to operate as the Borden Chemical Co., a division of the parent company with headquarters in New York City. Formerly known as the Chemical Division of the Borden Co., Borden Chemical Co. has a history dating back to 1929 when the parent organization acquired the Casein Co. of America. At that time, Borden renamed the firm as the Casein Manufacturing Co. of America, Inc., and operated it as a subsidiary. In 1936, the name of the concern was again changed, this time to the Casein Co. of America, Inc. Two years later, it became a division of the parent organization. The Borden Co. Chemical Division name was adopted in 1948, reflecting the expansion and diversification of the division's products. Today, Borden's chemical operations include 17 domestic and 11 foreign plants. Products manufactured include polyvinyl chloride resins and plastics, formaldehyde, and many specialized products for the paint, textile and paper industries. Borden adhesive formulations find application in many industries.

Yale Rubber Promotes Two

► Yale Rubber Manufacturing Co., Sandusky, Mich., has announced two promotions. Russell C. Henderson, an original founder of the company, has been named vice-president and will continue as treasurer. Edward Bielski, formerly production manager, has been promoted to factory superintendent. Previously associated with General Motors, Mr. Bielski, joined Yale Rubber in 1945.

Goodyear Tire Promotions

► Five top level executive promotions have been announced within the Tire Division of the Goodyear Tire & Rubber Co., Akron, Ohio. O. E. Miles, formerly Tire Division sales manager, has been named trade sales vice-president. The sales manager spot has been filled by R. W. Fitzgerald who was general merchandising manager. W. A Kemmel, tire department manager, and J. A Lewin, dealer department manager, moved into newly created positions as assistants to the vice-president, trade sales. C. W. Thorp, formerly western region manager, was called up from Los Angeles to become the tire division marketing manager. Mr. Miles has been associated with Goodyear for more than 25 years, joining the company as a member of the sales training squadron, he advanced through various divisions and was promoted to sales manager in 1956. Mr. Fitzgerald joined the company in 1924 as a truck tire salesman and held several sales titles before being appointed general merchandising manager. Mr. Kemmel started with Goodyear as a timekeeper in 1915, was named district manager at Los Angeles in 1938, and was promoted to manager of tire departments in 1952. Mr. Lewin joined Goodyear in 1928 as a counter salesman and adjuster, subsequently was assigned to the Lifeguard Sales division and was named tire department manager in 1944.

Minnesota Mining Promotes Two

► Minnesota Mining & Manufacturing Co., St. Paul, Minn., has appointed Robert N. Wolfe as general manufacturing manager of the Adhesives, Coatings and Sealers Division at Detroit, Mich., while Walter C. O'Leary has been named technical director. Mr. Wolfe, who graduated from the University of Minnesota, joined Minnesota Mining in 1939 and was formerly divisional production manager. He is a director and past-president of the Detroit Society for the Advancement of Management, and a member of the Engineering Society of Detroit, the Detroit Rubber and Plastics Group and the Employers' Association of Detroit. Mr. O'Leary, an alumnus of Detroit University, came to the company in 1947 and was previously manager of the division's laboratory in St. Paul. In his new position, working out of the Detroit headquarters, Mr. O'Leary will be responsible for all of the division's research, product development, technical service and field service activities. He is a member of the American Chemical Society.

Announces Price Reduction

► Monsanto Chemical Co., St. Louis, Mo., has reduced the prices of two of the company's newest patent-protected plasticizers by about 10 per cent. Trademarked Santicizer 213 and Santicizer 214, the price of the former has been reduced from 29½ cents to 27 cents, and that of the latter from 32½ cents to 29 cents in tank car and tank truck lots. Drum prices have been reduced in corresponding amounts.

Foreign Operations Add To Total Earnings of Tire Firms

► According to a recent article in the *New York Journal of Commerce*, foreign operations of leading American tire companies have been accounting for a growing proportion of their total earnings and profits during the past ten years of steady expansion of facilities abroad. In the case of Goodyear Tire & Rubber Co., for example, now operating plants in 20 countries, sales abroad, mainly of tire lines, have been running at some 25 per cent of consolidated gross income. The latter aggregated $1.3 billion in 1956.

Profitwise, the company's foreign activities contributed 28 per cent. Overseas subsidiaries of Firestone Tire & Rubber accounted for 21 per cent of net income in the same year. Moreover, tire manufacturers report that operations abroad net a higher return than domestic production. "We take a larger risk and, therefore, ought to expect to work on a higher rate of profit," one international executive explains.

There are four chief forms of business arrangements for these productive facilities overseas. They are: wholly-owned subsidiaries, associated plants, purchasing agreements, and technical service agreements. Each U.S. company has its own policy regarding the division of its foreign setup into these various types. B. F. Goodrich International, says president W. C. Gulick, operates almost entirely through minority ownership. Aside from a wholly-owned Canadian operation, the company owns from 22 to 49 per cent of the stock of 12 tire making firms in as many countries. Goodrich sets up the plant, provides the know-how, and enlists local capital into the venture, thereby giving the enterprise more of a local character.

Operating Agreements Vary

At least one company is operating purchase agreements, under which the producer arranges to take a percentage of the output of a foreign tire maker, providing formulas and patents, usually for limited periods, while the marketability of products in the area is being tested.

In many instances, American manufacturers have chosen to take technical service agreements, providing know-how and personnel for a fee. That these may account for a sizable proportion of business can be seen in the case of General Tire whose total foreign sales in 1957 have been estimated at $80 million. General's share of the profits of its foreign affiliates has been running at around $2 million, while management and technical assistance fees have been over $1 million.

There is a minimum base level of production below which establishment of a foreign factory is not economical. Mr. Gulick puts this at from 75,000 to 100,000 tires per year, or at least 300 a day. Operations frequently start off on a small scale than grow rapidly with market expansion. The Goodrich Holland plant, for instance, was turning out 500 units a day after the war. It is now producing seven times that number daily.

A plant with a 100,000-unit yearly capacity may cost between $3.5 and $4.5 million to build. Truck tire equipment is more expensive than plant for turning out passenger car tires and tubes. In the Philippines, where road transportation is so vital, 65 to 70 per cent of the Goodrich factory production is for truck lines.

James J. Lowe

Charles A. Chabot

Lowe and Chabot Named Vice-Presidents

► Peters Manufacturing Co., Wollaston, Mass., has announced the election of James J. Lowe and Charles A. Chabot as vice-presidents. Mr. Lowe, formerly sales manager of the American Mfg. Co., Brooklyn, N. Y., will be in charge of marketing. Mr. Chabot, previously associated with American Steel & Wire Co., Worchester, Mass., will head up the Research and Development Division. The company is a leading producer of tapes for the electrical cable industry.

Versenex 80 Chelating Agent

► Dow Chemical Co., Midland, Mich., has announced commercial production of "Versenex 80", a new chelating agent with potential use in the rubber industry. The product is said to be effective in a broad range of chelating applications with especial value in the control of iron ions. Versenex 80 differs from other Versene products in that it is based on diethylenetriamine, while the latter are based on ethylenediamine. Because of its higher molecular weight, more of the new material is required to chelate a given metal on a weight basis than is the case with other Versene products. However, the chelate structures formed with most metals are stronger and less susceptible to side reactions, the company claims.

Two Promotions Announced

► New Jersey Rubber Co., Taunton, Mass., has announced the appointment of Louis M. Corcoran as vice-president of sales and Robert Van Patten-Steiger as vice-president of manufacturing. Mr. Corcoran has been with the company for many years as production manager.

Develops Two New Red Pigments

► Pigment, Color and Chemical Division of the Sherwin-Williams Co. has developed two new Pyrazolone red pigments. "Plasticone Red Light 10465" and "Plasticone Red Medium 10464" complete the range of hues available in the Pyrazolone type pigment. Plasticone Red Light 10465 is a very opaque, bright, light shade pigment. Plasticone Red Medium 10464 is a medium shade pigment of medium opacity and brightness. The Pyrazolones as a class are said to have bright shades, be non-bleeding, have very good light resistance in full shades and to provide heat resistance superior to most red pigments. Unlike other organic reds, the Plasticones are completely insoluble in plasticizers. According to the company, they do not crack when used with common plasticizers and they do not migrate into adjacent white stocks. Bulletin C-71 gives detailed information on the complete line of Pyrazolone red pigments. It is available from the Pigment, Color & Chemical Division of the Sherwin-Williams Co., 260 Madison Ave., New York 16, N. Y.

Goodrich Buys Plant Site

► B. F. Goodrich Co., Akron, Ohio, has announced the purchase of 274 acres of land in Richmond County, near Augusta, Ga., for a possible plant site. Price of the tract and the type of plant which might be built were not disclosed. Goodrich operates a tire cord plant at Silvertown in west central Georgia.

Diamond Alkali Promotions

► Plastics Division of the Diamond Alkali Co., Cleveland, Ohio, a producer of polyvinyl chloride resins, has announced three personnel appointments to meet the increased needs of the division's expanding sales and technical service program. Jack E. Zimmerman, formerly group leader in Development for the Division, was named assistant manager of Research and Development; Joseph V. Hartman, Jr., previously technical service representative for the division, became group leader of the Applications Section of the Plastics Research and Development Laboratory, and Nathan M. Blackman, associated with the Plastics Division in an engineering capacity, was promoted to group leader in charge of the laboratory's Pilot-Plant Section, succeeding Mr. Zimmerman. All three men will continue to be located at the Diamond Research Center at Painesville, Ohio.

Mr. Zimmerman, an Ohio State University graduate, came to Diamond as a project engineer in Research and Development in 1951. He had been associated in various engineering capacities with Columbia-Southern Chemical Corp., and the Bailey Meter Co. Mr. Hartman previously worked for Koppers Co., Inc. He is a member of the American Chemical Society, the Society of Plastics Engineers, and is a graduate chemist from the University of Indiana. Mr. Blackman was an engineer in Plastics Research for Diamond for the past three and one half years. He is a graduate of City College of New York and holds membership in the American Chemical Society and the American Institute of Chemical Engineers.

Dow Introduces Light Absorbers

► Dow Chemical Co., Midland, Mich., has introduced a new family of light absorbers for use in products affected by ultraviolet radiations from the sun, the most harmful of which are in the range of 300 to 400 millimicrons. The new products include Salol (phenyl salicylate), TBS (tert-butyl phenyl salicylate), HCB (5-chloro-2-hydroxy-benzophenone) and DBR (dibenzoylresorcinol). The types of plastic that may be stabilized by their use include polyvinyl and polyvinyl halides, polyethylene, polyesters and cellulosics. Salol, the least expensive of the four, often is indicated for use where a moderate degree of protection is required. TBS is acceptable in certain food packaging films and HCB is useful for protecting metallized plastic products. DBR is unexcelled in resistance to ultraviolet breakdown, Dow says.

Hummel Offers Aluminum Powders

► Hummel Chemical Co., Inc., New York, N. Y., is offering a complete line of aluminum powders for use in rubber compounding. The pigment and film protector may be used in the production of balloon fabric, solid rubber tire stock and decorative rubber articles. The powders are available in atomized and flake forms with sizes varying from a very coarse to a very fine mesh.

F. E. Traflet

Offering Consulting Service

► F. E. Traflet, formerly vice-president in charge of sales and research for the Pequanoc Rubber Co., Butler, N. J., has announced the establishment of a consulting service on rubber with particular emphasis on sales development and marketing assistance for suppliers of rubber chemicals and compounding ingredients. Mr. Traflet will maintain his headquarters at 39 Elm St., Butler, N. J. Well known in the rubber industry, Mr. Traflet was graduated from New York University with a B. S. degree in chemical engineering. Upon his graduation, he joined the Habirshaw Wire & Cable Co., Yonkers, N. Y., working in various capacities in the plant and laboratory. In 1923, he joined the Pequanoc Rubber Co. as chief chemist. In his thirty-four years with the company he spent the greater part of his time on sales and sales service problems and in research. Mr. Traflet is a past-chairman of the New York Rubber Group, a past-president of the Rubber Reclaimers Association, Inc., and a member of the Division of Rubber Chemistry, American Chemical Society. He also holds membership in various local rubber groups about the country, and is a member of the Chemists' Club and the Society of Plastics Engineers. During World War II, he served as consultant to the War Production Board and the Office of Price Administration in Washington, D. C.

Introduces Poly-Sperse R-100

► National Polychemicals, Inc., Wilmington, Mass., has introduced "Poly-Sperse R-100", a new, low-cost activating plasticizer for rubber. The material was designed to maintain a high degree of hardness and stiffness in vulcanizates while imparting excellent processing characteristics to green stock. It is said to facilitate the dispersion of reinforcing pigments and to improve the mold flow of uncured compounds. According to the company, vulcanizates containing Poly-Sperse R-100 display better stress-strain, flex resistance and tear properties. The new product has a slight activating effect on cure accelerators.

Two New Oakite Divisions

► Oakite Products, Inc., New York, N. Y., has announced the establishment of two new divisions in the company's nationwide field organization. Rochester will be the headquarters of the new Upper New York State Division, which will consist of the technical field representatives and warehousing facilities now based in Albany, Utica, Syracuse, Binghamton, Elmira, Rochester, Buffalo and Scranton, Penna. The new Mid-South Division will consist of Oakite representatives in Cincinnati, Nashville, Little Rock, Knoxville, Louisville, Evansville, Jackson, Shreveport, Memphis and New Orleans. Walter G. Sittmann, formerly Oakite's Pittsburgh Division manager, has been transferred to head the Rochester Division. Mr. Sittmann, who has been with Oakite for 21 years, was for seven years a field representative in northern Indiana before he was appointed as Pittsburgh Division head in 1953. John P. Melhado, formerly a field representative in New York City, will succeed Mr. Sittmann in Pittsburgh. Mr. Melhado joined Oakite in 1949 after many years as a superintendent in metal finishing shops. Victor L. Baltzell, representative in Dallas for the last fifteen years, has been appointed manager of the Mid-South Division. Headquarters will be located in Louisville, Ky.

Water-Resistant Synthetic Rubber

► Parker-Hannifin Corp., Cleveland, Ohio, has announced that a new synthetic rubber compound has been formulated by the company's Rubber Research and Development Laboratory, which is said to have superior water resistant qualities. Designated "Parker Compound Number 37-021", the new material has been shown to be exceptionally water stable in a comparatively long exposure test of 1440 hours. Throughout this aging period, the company states, there is little or no change in volume or hardness of the new material. Parker Compound Number 37-021 was compounded to maintain low volume swell and to avoid shrinkage. It also has basic oil resistance. According to the company, the new material is suitable for use in domestic laundry machines, pump seals and impellers, liquid level switch diaphragms, water valve seals, oil slinger rings and many other applications.

Named Petrochemicals Manager

► Organic Chemicals Division of the American Cyanamid Co., New York, N. Y., has appointed B. R. Putnam, Jr., formerly manager of market development, as manager of the Petrochemicals Department. Headquarters will be located in New York City. A graduate of Princeton University, Mr. Putnam joined the company in 1947 as a chemical engineer. He became associated with Cyanamid's Market Research Department in 1949, was named manager in 1952 and became manager of market development in 1955. Mr. Putnam is a member of the American Chemical Society and the Chemical Market Research Association.

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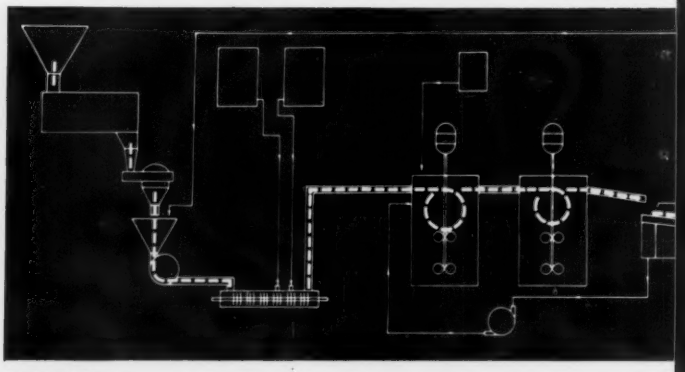

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STATEX-93 HMF High Modulus Furnace
STATEX-G GPF General Purpose Furnace
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Columbian pioneered with reinforcing carbon blacks... created MICRONEX more than four decades ago... made it a synonym for reinforcement! Today, Columbian's MICRONEX is the industry's standard for natural rubber, heavy-duty, truck tires... and heavy-duty insulation for wire and cables.

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Firestone Announces Elections

► Firestone Tire and Rubber Co., Akron, Ohio, has announced the election of two new vice-presidents. Joseph Thomas will serve as vice-president, secretary and general counsel, while Joseph A. Meek has been named vice-president of production. J. V. Cairns, formerly assistant director of industrial relations will succeed Mr. Meek as director of industrial relations. Mr. Thomas' career with Firestone started in 1943, when he joined the company as assistant secretary and general counsel. Mr. Meek, director of industrial relations since 1953, joined Firestone in 1925 in the Cost Department and has advanced through a series of management posts.

At the company's annual meeting of stockholders, preceding the board of directors meeting, all directors were re-elected, including Harvey S. Firestone, Jr., Lee R. Jackson, Raymond C. Firestone, John J. Shea, Harvey H. Hollinger and Joseph Thomas. Officers re-elected at the board meeting following the stockholders meeting were Harvey S. Firestone, Jr., chairman; Lee R. Jackson, vice-chairman; Raymond C. Firestone, president; James E. Trainer, executive vice-president; John J. Shea, vice-president; Harvey H. Hollinger, vice-president; Harold D. Tompkins, vice-president; Harold M. Taylor, vice-president; John L. Cohill, vice-president; Earl B. Hathaway, vice-president; Elton H. Schulenberg, treasurer; Claude A. Pauley, comptroller; Elden H. Eaton, assistant treasurer; Henry S. Brainard, assistant secretary; Byron H. Larabee, assistant secretary; Laurence A. Frese, assistant comptroller; Robert P. Beasley, assistant comptroller and Lee R. Shannon, assistant comptroller.

Licenses Italian Machinery Firm

► Farrel-Birmingham Co., Inc., Ansonia, Conn., has licensed S. A. Luigi Pomini, Castellanza, Varese, Italy, for the manufacture and sale of the company's complete line of machinery including Banbury mixers, mills, calenders and extruders. The machines will be made in strict accordance with Farrel-Birmingham designs. Pomini, since 1949, has also engaged in the manufacture of a complete line of rubber-processing machinery, including Banbury mixers, under license from David Bridge & Co., Ltd., Castleton, Rochdale, England, which has been manufacturing Banbury mixers and other rubber machinery in association with Farrel-Birmingham for nearly 40 years.

Glasgow Tire Factory Opens

► A factory costing $7,287,500 and reported to be the world's most modern tire-making plant, has been opened at Garscadden, about seven miles from Glasgow, Scotland. The site covers 58 acres and the new factory could be expanded to five times its present size. The plant will provide Scottish users with a complete tire service—new tire manufacture, service and repair facilities and factory remolding.

R. S. Wilson

Victor Holt

R. S. Wilson Retires at Goodyear; Holt Named to Top Sales Post

► Changes in the top level management of the Goodyear Tire & Rubber Co., Akron, Ohio, have been announced with the retirement of R. S. Wilson, executive vice-president and veteran sales head of the company. Victor Holt, formerly vice-president and tire sales manager, has succeeded to the title of vice-president in charge of sales. Mr. Wilson's retirement comes after 45 years of service. For 30 of those years he was sales head of the company. Mr. Wilson is a holder of the Charles Coolidge Parlin Memorial Award for outstanding accomplishment in the field of marketing, an honorary member of Beta Gamma Sigma, and the author of treatises and lectures in sales and marketing. He served as a director of special rubber programs for the War Production Board during the final phase of World War II. Mr. Wilson was elected to the Goodyear board of directors in 1932 and executive vice-president in 1956.

Mr. Holt joined Goodyear in 1929 after graduating from the University of Oklahoma. He came up through the sales ranks, serving in many parts of the country as general line salesman, adjuster, store manager and district sales manager. Since 1942, he has been in the Akron headquarters organization in various sales capacities. He became vice-president and a member of the Executive Operating Committee in 1956.

Goodyear Introduces Wingstay T

► Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has introduced "Wingstay T", a non-staining, non-discoloring antioxidant, designed to protect either raw or compounded polymers. A liquid hindered phenol, the product is said to provide raw polymer stability, compounded and cured physical protection and non-staining and non-discoloring properties. The company states that Wingstay T will protect compounded natural, butadiene-styrene and nitrile rubbers in any light colored application.

Named Tylac Representative

► Chemical Division of the International Latex Corp., Dover, Del., has announced the appointment of Latex and Rubber, Inc., Baltimore, Md., as sales representative for "Tylac Latices" in New York, New Jersey, Pennsylvania, Maryland, Delaware and parts of Virginia.

Plan Chemical Exposition

► The Tenth National Chemical Exposition, sponsored by the Chicago Section of the American Chemical Society, will be held at the International Amphitheater in Chicago September 9 through 12, 1958. During the same week, the 134th National Meeting of the Chemical Society will also be conducted in Chicago. The exposition will be housed in the main building of the Amphitheater with some displays in the new exhibit hall area. Parking space is available on the adjoining grounds and special chartered buses will be provided to carry ACS registrants between the meeting rooms and the hall. A working committee has been appointed to plan the various features of the exposition, including Trail Blazers, Art, Photographic and other special exhibits. Floor plans and a prospectus will be ready for distribution soon from the office of the Chicago Section ACS, 86 E. Randolf St., Chicago 1, Ill.

Signal Corps Sponsors Symposium on Communication Wires and Cables

Three-Day Session at Fort Monmouth Features Many Interesting Papers

► The Sixth Annual Symposium on "Technical Progress in Communication Wires and Cables", sponsored by the Communications Department of the U.S. Army Signal Engineering Laboratories, Fort Monmouth, N. J., was held on December 3, 4, and 5, 1957, at the Berkely Carteret Hotel in Asbury Park, N. J. The first session was held on Tuesday, December 3 and was chaired by M. G. Caine (Monsanto Chemical). Brigadier General Earle F. Cook (U. S. Army Signal Engineering Laboratories) delivered the welcoming address.

The first paper, "Foamed Polyethylene Coaxial Cables", was presented by G. R. Karlson and C. C. Camillo (Amphenol Electronics). The authors claimed that research had demonstrated that the use of cellular polyethylene dielectrics in coaxial cables appeared to offer advantages by providing lower losses and lower capacitance without sacrificing physical size and weight.

"Low Loss Coaxial Cable for Microwave Service", was delivered by J. Agrios (Royal Electric) and I. T. Stoneback (Federal Telecommunication Laboratories). In this paper, it was recommended that the construction of the modified RG-9B/U cable be incorporated in Military Specification MIL-C-17B. It was believed that this cable would be of great advantage to the Armed Services because of its stability, and to the manufacturers of aircraft and missiles because of the saving in weight.

High Temperature Aircraft Wires

H. L. Wilson and W. F. Horstman (General Electric) spoke on "High Temperature Aircraft Wires". Concerned with the development of wire for aircraft application, the authors said that increasingly severe performance requirements are demanded in this industry, and they described some of the materials on which tests had been conducted. Because of temperature requirements as high as 1000°F., it was concluded that it seems likely that insulation must be almost completely, if not entirely inorganic in nature.

In a paper entitled "Electrical Testing of Polyvinyl Chloride Formulations", W. E. Koerner, R. H. Munch, J. R. Taylor and M. W. Williams (Monsanto Chemical), discussed test methods. They contended that test methods which closely simulate specification conditions must be used to measure accurately the electrical quality of insulating materials and their ingredients. The paper described a new method for studying the long-term water immersion resistivity of polyvinyl chloride electrical insulating compounds.

J. G. Hendricks and N. L. Cooperman (National Lead) spoke on "Some Aspects of Stabilization of Vinyl Insulation". They stated that present day conditions and practices require the utilization of every aspect of compounding and processing techniques to provide marketable products in terms of electrical characteristics and stability. The effects of specific factors including stabilizer, plasticizer, lubricant and filler selection, coating of solid components, weathering, predispersion of components and processing, and test temperature were delineated with particular reference to the possibilities inherent in less conventional approaches to these familiar areas. The interdependence of these factors minimizes the chance of successful results through unilateral consideration of isolated properties. It was concluded that desired results are more likely to be realized by approaching compounding and processing with a fresh viewpoint and defining test and evaluation parameters in terms of the specific problem at hand as opposed to routine practices possibly more relevant to less competitive and demanding days.

The second technical session was held in the afternoon, on Tuesday, December 3 with C. T. Wyman (Bell Telephone Laboratories) acting as chairman.

"REA Specifications for Wire and Cable for Direct Burial on Rural Telephone Systems by REA Borrowers", was presented by C. R. Ballard, F. F. Farnsworth and A. L. Richey (Rural Electrification Administration, U. S. Department of Agriculture). The paper described new types of wire and cable which have now become available, together with more economical methods of installing them. It is believed that these developments make burial construction competitive with aerial construction where soil conditions are favorable.

Rural Distribution Systems

A. C. Benner, J. W. Davis and D. G. Wilson (Southern Bell Telephone) delivered a paper on "Buried Rural Telephone Distribution Systems". According to the authors, analyses indicated that "in-plant" cost of buried PIC cable is from 15 per cent to 30 per cent less than that of equivalent aerial plant exclusive of pole line costs. This method has been found to be feasible in much more difficult terrain than was originally thought possible.

In a paper entitled "Communication Underground Distribution Plant in Urban Areas", C. H. Elder (Illinois Bell Telephone) cited trials by the Illinois Co., which indicate that only modest improvements in trenching and backfilling equipment and construction methods are needed to make all underground telephone plant, urban and rural, as cheap as aerial installations.

M. O. Brown (General Telephone Co. of Illinois) presented a paper entitled "Experiences with Self Supported Plastic Telephone Cable". Mr. Brown believes that self supported plastic telephone cable has been shown to be one of the most economical means of providing additional rural facilities.

"Cable Splicing Goes Modern", by W. C. Kleinfelder (Bell Telephone Laboratories) introduced a new method of cable splicing which is said to be faster, easier and to produce better joints.

E. W. Bollmeier (Minnesota Mining and Manufacturing) spoke on the topic of "Field Reliability of the Shear Type Sealing Connector". Mr. Bollmeier summarized and analyzed advantages and limitations of the shear type sealing connector, Model 1957.

G. Hamburger was chairman of the morning technical session held on Wednesday, December 4.

Fast Curing Neoprene Compounds

"Extrusion of Fast Curing Neoprene Wire and Cable Compounds", by L. Simmons and C. E. McCormack (DuPont), described a new processing method designed to improve manufacturing techniques in the production of neoprene covered wires and cables. The method consists of chopping the unaccelerated compound into small pellets and blending in a tumbler with pellets of accelerator masterbatch and then feeding this blend into the extruder. Extruders now being used by the cable industry for handling cold feed are capable of simultaneously mixing and extruding the pellet stock.

The authors stated that economies would result if it were possible to operate the continuous vulcanizing (CV) machines at higher speeds, and also if it were feasible to CV cure many of the large size cables currently being vulcanized by the more expensive lead press method. Some advantages of the new processing methods were listed as follows: 1) faster CV speeds; 2) replacement of lead press cure in some cases; 3) low temperature CV cures, and 4) application over plastics.

A. C. Rowley (R. T. Vanderbilt) presented a paper entitled "Compounding for Heat Resistant Insulations and Jackets". The work reported in this paper was designed to indicate compounding methods by which the necessary improvements in typical insulation and jacket formulations might be obtained. Experiments with butyl, SBR and neoprene were described. The results of the compounding studies showed ways in which superior heat aging performance suitable to meet that required by Underwriter's RHH designation might be built into butyl rubber and probably SBR for insulations and into neoprene for jackets. The author also states

that Sulfads is shown to be a particularly valuable vulcanizing agent and accelerator for all three types of elastomer, when such superior agings are required. For neoprene, an antioxidant combination of Agerite Stalite, Agerite Superlite and Butyl Zimate has a strong protective action for elevated temperature service.

"Pre-Dispersed Accelerators in Rubber Compounds" was presented by John Ware (Ware Chemical). Mr. Ware said that predispersing accelerators, activators, vulcanizing agents and other dry ingredients in a suitable plasticizer by means of a three roll ink mill, result in safer, less scorchy compounds; tighter, faster cures and better heat aging. This is due to improved uniformity and shorter heat history in factory size batches and more effective use of these chemicals. Such dispersion of individual chemicals or complete accelerations can be made stiff enough to be practical to handle and weigh in production. Test data was given for: (1) a styrene rubber RH RW formulation, with ultra accelerators and low sulfur showing improved physicals and better air bomb and air oven aging; (2) a neoprene type W Black Jacket Compound, using zinc oxide and NA-22 showing that increased activity of dispersed Zinc Oxide, and (3) a water resistant type W Neoprene compound cured with varying amounts of red lead. Indications were that low mechanical water absorption can be obtained with less red lead if dispersed, the author believed. He continued to say that with the arrival of automation, use of complete accelerations so dispersed would simplify weighing equipment.

Also presented at this session was a paper called "Operation Deep Freeze", by E. W. Most (Bureau of Dock and Yards, U. S. Navy).

V. McBride (Plastic Wire & Cable Corp.) chaired the afternoon technical session on Wednesday, December 4.

Discusses Hi-Fax Coverings

W. P. Acton and W. O. Bracken (Hercules Powder) presented a paper entitled "New Developments in Hi-fax Coverings for Wire and Cable". The paper brought up to date information given at last year's symposium on Hi-fax, the company's high density polyethylene. The authors detailed experiments which showed that through proper choice of polymer, it is possible to achieve a high degree of resistance to environmental stress cracking and to thermal shock while retaining the desired characteristics of processability and toughness.

"The Effect of Stock Temperature on the Physical Properties of Polythene Insulation for Linewire" was the title of the paper presented by J. A. Durno (Canadian Industries). This paper showed that the ultimate tensile strength and elongation at break of low density polythene coatings on wire are dependent upon the stock temperature which the extrudate has attained by the time it has come into contact with the moving conductor.

Presentation of "The Interrelationship Between Density and Dielectric Strength of High Pressure Polyethylene for High Voltage Applications in Insulated Wires", was made by A. S. Silver (Royal Electric). Data was presented showing that branched polyethylene manufactured by the high pressure system must be insulated properly in order to maintain a high density and crystallinity to give maximum dielectric strength in cable.

The next paper, "Evaluation of Carbon Black Dispersions in Polyethylene", was presented by R. M. Schulken, Jr., G. C. Newland and J. W. Tamblyn (Tennessee Eastman). A study was made of the effect of carbon black dispersions on the weatherability of polyethylene. Pending further weathering data, the authors believed it seemed reasonable to conclude tentatively that a carefully standardized absorbtivity measurement at a fixed film thickness with white light can give a useful prediction of the weatherability of polyethylene pigments with carbon black.

The last session was held on Thursday, December 5, and was chaired by E. J. Merrell (Habirshaw Wire & Cable).

M. G. Dinsmore, Jr., (Western Electric) delivered the first paper, which was entitled "Bulk Handling of Polyethylene in Cable Manufacturing". Mr. Dinsmore told of problems related to the introduction of the new Polyethylene Insulated Conductor Exchange Cable Program by the Western Electric Co. at the Point Breeze works. He described the company's method of handling economically, the millions of pounds of polyethylene that are consumed there annually.

"Techniques for Insulating Wire & Cable with Silicone Rubber", was presented by D. C. Youngs, D. J. Badamo and M. N. Culver (Dow Corning). Experiments began with an effort to find a mechanical feed which would reduce the amount of labor required to extrude silicone rubber. Roller feed equipment has been developed that makes an effective mechanical feed for silicone rubber extrusion. Such a feed, the authors claimed, provides efficient feeding and serves to reduce labor required in the extrusion operation.

Six designs of extruder screws were evaluated on the basis of output, efficiency, variation of output, and temperature build up of stock to determine the design most suitable for extrusion of silicone rubber. A single flight, decreasing pitch, extended screw with a compression ratio of about 3 to 1 appeared to give best all-round performance. Blistering of insulation during extrusion could often be eliminated by removal of trapped air in the wire stranding by applying a vacuum to the extruder head. Speed of insulating wire when using hot air vulcanization techniques could be substantially increased by heating the conductor prior to the extrusion of 300°F. to 400°F. Semivulcanized tapes offered advantages over currently used taped constructions by utilizing fully cured tapes.

"Controlled Pressure (Valve) Extrusion" was presented by B. H. Maddock, H. J. Nalepa and Z. Zurkoff (Bakelite). The authors believed that the development of the controlled pressure (valve) extrusion provides the industry with a new and practical tool that substantially improves extruder performances. It is said to enable fabricators to improve extrusion product quality and to maintain it at a commercially acceptable level at the top screw speed of which the machine screw is capable.

Extrusion of Teflon Resin

The last paper presented at this session was "The Extrusion of 'Teflon' 100X Perfluorocarbon Resin, a New Melt Extrudable Material for Wire Insulation", by R. E. Stabler (DuPont). A new product called "Teflon 100X" and offered for sale in developmental quantities by the Polychemicals Department of DuPont, was described. The paper gave the electrical and physical properties of this new melt-extrudable perfluorocarbon resin, as well as the extrusion conditions for processing the material into various constructions. The material is said to be processed rapidly and efficiently by conventional processing equipment and to have an outstanding combination of properties that make it an ideal wire insulating and jacketing material.

Among other papers presented at the technical sessions was "Leakage of Electromagnetic Energy from Coaxial Cable Structures", by Dr. Kurt Ikrath (U. S. Army Signal Engineering Laboratories). Dr. Ikrath said that a better understanding of the mechanism of electromagnetic cables was obtained through solution of 1) leakage from infinitely long solid wall shielded cables; 2) leakage from infinitely long braid shielded cables, and 3) leakage from cables of finite length including the effects.

Newton H. Tuthill

Promoted by American Hard Rubber

► Newton H. Tuthill, formerly vice-president and general manager of the American Hard Rubber Co., Butler, N. J., has been appointed president. American Hard Rubber is a division of the Amerace Corp., New York City, of which Mr. Tuthill is a vice-president. A graduate of Norwich University and Harvard Graduate School of Business Administration, Mr. Tuthill joined American Hard Rubber in 1937 and was previously executive vice-president and general manager of the Pequanoc Rubber Co., another unit of Amerace.

Reorganizes Sales Districts

► Chemical Division of Eastman Chemical Products, Inc., has reorganized its field sales activities into three regional areas in order to improve communications between the field sales staff and headquarters in Kingsport, Tenn., where final coordination between research, development, service, market research and sales planning is done. Robert H. Cannon, who has been in charge of the division's New York office will direct sales of chemicals and dyes in the New England, and Middle Atlantic states, including the operations of the company's distribution center at Lodi, N. J. John H. Sanders has been named regional sales manager for those areas served by the division's Cleveland, Cincinnati and Greensboro, N. C., offices as well as other areas of the South and Southeast. Mr. Sanders was formerly in charge of the division's Cleveland office and more recently, product manager for all chemicals produced at Kodak's Texas Eastman Company Division. Decatur B. Campbell, Jr., has been appointed regional sales manager of the mid-western area and as such will direct the sales of the division's products in those areas served by the company's Chicago, St. Louis and Houston offices. Prior to the new appointment, Mr. Campbell was in charge of the division's Chicago office.

Expanding Butadiene Production

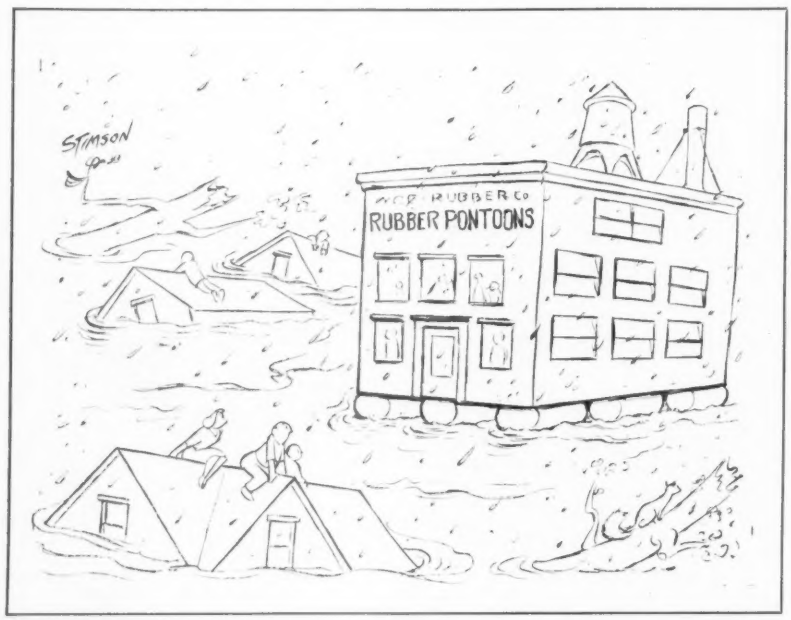
► Firestone Tire & Rubber Co., Akron, Ohio, has announced that plans are being mapped out for the expansion of the company's four-month-old butadiene plant at Orange, Texas. The Orange plant has a rated capacity of 40,000 tons annually, and supplies a substantial portion of the butadiene used at Firestone's synthetic rubber plants at Lake Charles, La., and Akron, which have a combined annual capacity of 230,000 tons.

Ontario Group Hears Byard

► The December 10th meeting of the Ontario Rubber Group held at the Pines Restaurant in Stoney Creek, Ont., Canada, featured an address by K. Byard, vice-president in charge of manufacturing for Dunlop Canada, Ltd. Approximately 90 members and guests were in attendance. In his talk on "The Technical Man in Other Continents," Mr. Byard noted that the expansion of the rubber industry, outside the main manufacturing territories of North America and Europe, is proceeding as quickly as technical personnel can be trained. Mr. Byard declared that technical qualifications may often be less important than the manner in which the technical man adapts himself to new climates, strange dress, different languages and the political atmosphere. Wide differences in business methods and the employment of less expensive labor call for different methods of approach to the technical aspect of production problems. The speaker went on to offer a comparison of living and working conditions in India, South Africa, New Zealand, Europe and North America. Mr. Byard concluded that men with overseas experience are more tolerant of the opinions of others on their return to the home countries.

Named Division General Manager

► Raybestos-Manhattan, Inc., Passaic, N. J., has appointed S. R. Zimmerman, Jr., as general manager of the company's U. S. Asbestos-Grey Rock Division, Manheim, Penna., succeeding O. H. Cilley. Mr. Zimmerman has been associated with the division for the past 25 years, most recently as assistant general manager. He is also a vice-president and director of Raybestos-Manhattan. Mr. Cilley continues as a vice-president and director of the corporation and will also serve in an advisory and consulting capacity.



Materials Handling Conference

► The American Society of Mechanical Engineers has announced that it will sponsor a national conference on materials handling at the Public Auditorium in Cleveland, Ohio, on June 9-12, 1958, in conjunction with the National Materials Handling Exposition. The conference will be the first to be sponsored by the society since 1949, and is in accordance with the society's policy of encouraging its professional divisions to sponsor separate national conferences devoted to serving mechanical engineers in their particular fields. According to John C. Somers, chairman of the society's Materials Handling Division and president of Industrial Products Engineering Co., "Few engineering problems which face management today are as important as materials handling." He stated that "Despite a decade of constant effort, materials handling remains one of the few places where substantial cost reduction can be effected." According to Mr. Somers, the exposition will have one of the largest and most varied displays ever gathered of materials handling equipment. The conference will be held concurrently with the show because it is believed that the exhibit will provide an important practical background to the scientific discussions. The exposition will be produced by Clapp & Poliak, Inc., New York, N. Y., exposition management firm.

Naugatuck Promotes Borg

► E. Leonard Borg has been named manager of synthetic rubber development for the Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn. Mr. Borg, formerly assistant manager of synthetic rubber development, joined Naugatuck Chemical in 1942 as a technical trainee in the Synthetic Rubber Division. Later that year, he was assigned to the Institute, West Va., synthetic rubber plant, which the division then operated for the government, and within four years was promoted to technical superintendent. He returned to Naugatuck and was assigned to the Colloidal Products Sales Department for the next three years. Mr. Borg then resumed development work and became assistant manager of colloidal products development. In 1955, he was appointed assistant manager of synthetic rubber development. He was a member of a three man team that developed, under a government-sponsored program, the cold latex formulation now in industry-wide use for the production of foam rubber. He also contributed to development work on new polymerization techniques for oil-resistant and other specialty grade synthetic rubbers. Mr. Borg holds a bachelor's degree in chemical engineering from Rensselaer Polytechnic Institute.

► Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, L. I., N. Y., has announced the availability of brilliant tarnish resistant bronze gold and copper pastes for pigmenting vinyl. The complete range of gold and copper shades permits production of opaque, stardust and glitter effects.

CCDA Meeting To Discuss Impact of Synthetic Rubber

► The annual meeting of the Commercial Chemical Development Association, which will be held on March 27th at the Statler Hotel in New York City, will have as its theme, "The Commercial Impact of Synthetic Rubber." Clayton F. Ruebensaal (Texas-U.S. Chemical), program chairman, has announced that there will be a morning and afternoon technical session and a featured speaker at luncheon. At the completion of the afternoon program, there will be a social hour and the annual banquet, at which the 1958 CCDA Honor Award will be presented.

The morning session will start with a discussion of "European Developments in Rubber," by Alan Pickett, editor, *Rubber and Plastics Age*, London, England. H. C. Bugbee, president of the Natural Rubber Bureau, will talk about "Commercial Developments in Natural Rubber," and Osgood Tracy, president of the Enjay Co., Inc., will have as his subject, "Commercial Developments in Synthetic Rubber."

At the luncheon, John R. Blanford, counsel, House of Representatives, Committee on Armed Services, will describe "Congress and the Synthetic Rubber Industry." The afternoon session will include four separate panel discussions, each of which will be headed by leaders of the American rubber industry. Panel titles and moderators are:

"The Commercial Development of Purchased Government Facilities," W. P. Gee, president of the Texas-U.S. Chemical Co.

"Influence of Synthetic Rubber on Other Industries," C. J. Harrington, director of sales, Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc.

"Growth Forecasts for Rubber and the Impact of Other Materials," Ross R. Ormsby, president of the Rubber Manufacturers Association.

"Growth Prospects for Rubber Raw Materials and Compounding Agents," William B. Plummer consultant.

Issues New Engineering Report

► Research Association of British Rubber Manufacturers has released Research Report No. 84, entitled *Shape Factors and Functions in Rubber Engineering*, by A. R. Payne. The data and methods given in the report are said to present a simple and logical means of calculating the force/deformation relationships for most of the commonly used forms of component, given the one basic property of elastic modulus, either static or dynamic, according to the type of deformation encountered in service. According to the report, the effective stiffness of a rubber component can be expressed as the product of three quantities: the elastic modulus of the rubber, the degree of compression, and a 'shape function' depending solely on the geometrical configuration of the component. Copies of the report may be obtained from the Association at Shawbury, Shrewsbury, Shropshire, England. The report is priced at $2.94 to non-members.

MAN in the NEWS

Arthur Wolf

► Engaged in Federal Service for more than twenty years, Arthur Wolf has become well-known to the rubber industry through his activities on rubber problems. Born in Waltham, Mass., on October 28, 1909, Mr. Wolf attended Tufts College and the graduate schools of the Massachusetts Institute of Technology and Harvard University, majoring in chemistry. He entered Federal service as a research chemist with the Food and Drug Administration in August, 1936, and remained with that organization until January, 1942. At this time, he was transferred to the Bureau of Ships, Navy Department, with responsibility for estimating Naval requirements for chemicals and rubber utilized in the shipbuilding program.

During this time he participated in the preparation of material for the Baruch Rubber Survey Committee and in September, 1942, was transferred to Mr. Forrestal's office to serve on the staff of the Navy Rubber Survey Committee under Arthur M. Hill. In January, 1943, with the appointment of Mr. Hill as Navy Rubber Director, Mr. Wolf assumed the post of Special Assistant. From 1943 to the end of World War II, Mr. Wolf represented the Navy Department in the Office of the Rubber Director and in the Rubber Bureau of the War Production Board.

On December 7, 1945, Mr. Wolf received the Meritorious Civilian Service Award from the Secretary of the Navy for his work in helping solve the Navy's rubber problems. In October, 1947, with the designation of Arthur Hill as first Chairman of the National Security Resources Board, Mr. Wolf become Special Assistant on Rubber to Mr. Hill. In this capacity, he prepared material and testified before Congressional Committees leading to the passage of the Rubber Act of 1948. In 1948, 1949 and 1950, with the aid of the rubber industry, he prepared a proposed mobilization plan for the industry.

In 1949 and 1950, he was NSRB representative on the White House Committee which prepared the report for the President on the maintenance of the synthetic rubber industry in the U.S. and the disposal of the government-owned synthetic rubber facilities. In January, 1951, Mr. Wolf became head of the Rubber Branch of the Defense Production Administration and in 1953, he became Director of the Chemicals and Rubber Division in the Office of Defense Mobilization. He represented ODM in several interagency committees concerned with the drafting and presentation of legislation leading to the Rubber Producing Facilities Disposal Act of 1953.

In 1956, Mr. Wolf chaired the committee and drafted the President's message on the Nation's Rubber Requirements and Resources, published as House Document No. 391, April 30, 1956. In August, 1957, he was appointed Executive Director of a Special Stockpile Advisory Committee.

During his career in the Government, Mr. Wolf has been a member of the State Department Rubber Panel and attended six of the annual meetings of the International Rubber Study Group as advisor to the State Department delegate. He chaired the NSRB Interagency Rubber Advisory Committee from 1948 to 1951 and the ODM Rubber and Chemicals Interagency Advisory Committee from 1953 to the present time. This latter committee concerns itself primarily with policy problems on rubber, particularly relating to the stockpile.

Married, with three children, Mr. Wolf lists his hobbies as fishing and music. In his present capacity as Executive Director of the Special Stockpile Advisory Committee, ODM, Mr. Wolf will continue to be vitally interested in those matters which have great relevance to the rubber industry. Mr. Wolf's career has carried him through some of the most difficult times the nation and the industry has faced. Through these years, he has performed his duties with devotion and distinction looking forward to tasks that still lie ahead.

This is the first in a series of articles devoted to a recognition of the accomplishments of outstanding industry figures as selected by the editorial staff of RUBBER AGE.

Names in the News

Bert S. Taylor, vice-president of the Organic Chemicals Division, Food Machinery and Chemical Corp., has been named director of marketing and purchasing in charge of all sales and purchasing activities.

Alan J. Woodfield, formerly executive vice-president and general manager of LaFavorite Rubber Manufacturing Co., has been appointed controller of the Sealol Corp. of Warwick, R. I., and **Robert K. Rockwell,** formerly president of Rockwell Advertising, Inc., has been named marketing manager.

Albert D. Neipris, previously buyer of raw materials for the Hodgins Paper Co., has been named purchasing agent for the Thermoplastics Division, Blane Corp., Canton, Mass.

Robert S. Buffum, former engineering manager of the New England Confectionary Co., has joined the Polyco-Monomer Department, Borden Chemical Co., as a project engineer.

Edgar A. Haine, associated with the Bakelite Co. for more than 20 years, has been named general superintendent of the Ottawa, Ill., plant.

Russell L. Maxwell, formerly senior vice-president of American Machine and Foundry Co., has been named consultant for Tracerlab, Inc., Waltham, Mass., on nuclear applications in industrial and military activities to provide liaison to U. S. government agencies.

Frank D. East, formerly manager of the Akron Branch, Dill Manufacturing Co., has been appointed assistant sales manager succeeding **H. W. Baker,** who has retired.

C. A. Pentz, Jr., former technical editor, has been appointed group leader in the Development Department of Union Carbide Chemicals Co., at the South Charleston, West Va., plant.

C. C. Gibson, vice president in charge of the Automotive Products Division, Goodyear Tire & Rubber Co., has been presented with a service pin commemorating 20 years of continuous service.

John Roach, previously chief engineer, has been appointed vice-president in charge of production and development of Hodag Chemical Corp., Chicago, Ill.

L. S. Hilton, previously assistant sales manager of the Abrasive and Diamond Wheel Department, Manhattan Rubber Division, Raybestos-Manhattan, Inc., has been named sales manager succeeding **W. H. Steinberg,** who has become the Department's technical consultant.

John K. Moffett, Jr., who has been associated with the company since 1948, has been appointed assistant manager of Petrothene polyethylene sales for the U. S. Industrial Chemicals Co.

Robert W. James, formerly with Haartz Mason, Inc., and the Vulcan Rubber Corp., has been appointed to the sales staff of Chemical Rubber Products, Inc.

Donald K. Slade, who served most recently as a lieutenant in the U. S. Army, has joined the Polyco-Monomer Department of the Borden Chemical Co. as a process engineer.

Philip S. Nettler, who served previously in a similar capacity for the Frankel Display Fixtures Co., has been named display fixture manager for the International Latex Corp.

Douglas Kiernan, formerly purchasing agent for Colonial Aircraft, has been appointed purchasing agent for Stowe-Woodward, Inc.

Thomas J. Campbell, previously assistant sales manager of Metasap, has been appointed sales manager of the Metasap Chemical Co., a subsidiary of the Nopco Chemical Co., succeeding O. E. Lohrke.

Robert D. Hawkins, formerly manager in the Long Hose Department, has been promoted to assistant factory manager at the Republic Rubber Division of the Lee Rubber & Tire Corp.

Frank X. Dwyer, who joined the company in 1949, has been appointed general sales manager of the Nuodex Products Co., division of Heyden Newport Chemical Corp.

John F. O'Sullivan, formerly associated with the American Machine and Foundry Co., has been named contracts manager for Tracerlab, Inc.

Howard M. Packard, previously executive vice-president and a director, has been named president and chief operating officer of S. C. Johnson & Son, Inc., succeeding **Herbert F. Johnson,** who will continue as chairman of the board and chief executive officer.

William H. Rader, formerly with National Petro-Chemicals Corp., has been named assistant production manager for Petrothene polyethylene resins by the U. S. Industrial Co., a division of National Distillers and Chemical Corp.

J. M. Gerber, formerly California district sales manager has been appointed western regional sales manager for the Wire and Cable Division of the Electric Auto-Lite Co.

Alan W. Bryant

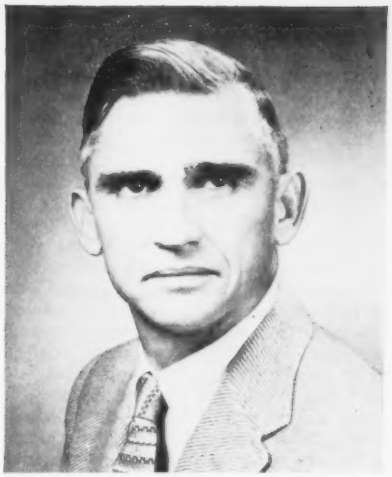
Appointed Assistant Sales Manager

► Alan W. Bryant, formerly eastern district sales manager, has been appointed assistant sales manager for Mapico colors in the Carbon Black and Pigment Division of the Columbian Carbon Co., New York, N. Y. Mr. Bryant succeeds John T. Kealy, who has been named sales consultant to the Mapico Color Unit. Mr. Bryant joined the technical service staff of Binney & Smith Co. following graduation from Dartmouth College in 1937. In 1942, he joined the Akron sales office of Binney & Smith and in 1946, he opened that company's Boston sales office. He transferred to Columbian in 1955, when Columbian took over sale of its products previously handled for the firm by Binney & Smith. Mr. Bryant is a member of the American Chemical Society; the A. C. S. Rubber Division; the Boston Rubber Group, of which he is past chairman; the Rhode Island Rubber Club and the Chemists Club in New York City.

Dr. Stephen J. Kennedy, Research Director, Textile, Clothing, and Footwear Division, Quartermaster Research and Development Center, Natick, Mass., has been named to receive the Harold De Witt Smith Memorial Medal from the American Society for Testing Materials, for outstanding achievement in research on fibers and their utilization.

Edgar I. Crowley, who was formerly with the Davison Chemical Co., has been named senior chemical engineer in the Engineering Development Section, while **John R. Weinert,** previously with the Sterling Varnish Co., has been named chemist in the Protective Coatings Section for the Research and Development Department of the Pittsburgh Coke and Chemical Co.

Roger G. Richards has been promoted from manager of research and development to sales manager of the Plastics Division for the Diamond Alkali Co.



Richard H. Dorsett

Dorsett Joins Witco Chemical

► Witco Chemical Co., New York, N. Y., has announced that Richard H. Dorsett has joined the sales staff of the company's Houston, Texas, sales office. Mr. Dorsett, who will make his headquarters in Dallas, will handle products of the Emulsol, Organic Chemicals, and Rubber Chemicals Divisions. A graduate of Texas A & M, Mr. Dorsett formerly worked for Olin Mathieson Chemical Co.

Wooster Rubber Changes Name

► Wooster Rubber Co., Wooster, Ohio, has announced a corporate name change to Rubbermaid, Inc. The brand name, "Rubbermaid", originally was coined to help highlight the function of the company's first product—a rubber dustpan—which was manufactured in 1934. In announcing the title changeover to Rubbermaid, Inc., officials said that the brand name of the company had become such a valuable asset that a name change had been considered periodically in recent years. This action was deferred while the company was adding to its houseware line of molded rubber and wire covered items with the addition of a new plastic products group which now includes mixing bowls, dish pans, wastebaskets, pails and other household items.

U.S. Testing Bulletins

► United States Testing Co., 1415 Park Ave., Hoboken, N. J., has announced the general availability of its "Instrument Service Bulletins." United States Testing manufactures a wide range of testing instruments for sale to industry, commerce and government. The company is prepared to work with companies, organizations or individuals in the development of new testing instruments and test methods. The bulletins published by the company detail some aspect of company activities. The current bulletin, Volume 3 No. 5, is devoted to "Fatigue: Common to Man and Materials." Interesting details as to fatigue measuring instruments may be found in the bulletin.

Minnesota Rubber Changes Name

► Minnesota Rubber and Gasket Co., Minneapolis, Minn., has changed its corporate name to the Minnesota Rubber Co. and completed a realignment of its five subsidiaries. Founded in 1946 by George E. Carlson, now chairman of the board, Minnesota Rubber Co. has grown to be a leading producer of O-rings and is a major supplier of custom molded rubber parts and special process products for American industry. Minnesota Rubber subsidiary companies, realizing an increased scope of operations in recent years, have been centralized and given divisional status within the parent corporation. These subsidiaries originally had been organized to provide specialized products and services. The divisional reorganization includes the Silicone Rubber Division, manufacturer of silicone rubber parts; Plastics and Latex Division, producer of dipped and molded rubber and plastic products; Rainbow Rubber Division, producer of colored rubber parts; the Research and Development Division, and the Tool and Die Division. The manufacturing divisions will continue to operate in their separate plants in St. Louis Park, a Minneapolis suburb. Sales and service activities and corporate staff functions are being consolidated within the parent company at the main plant and general offices.

Akron Offers Advanced Course

► An advanced course in rubber technology is currently being presented by the University of Akron, Akron, Ohio, in cooperation with the Akron Rubber Group. A sequel to an earlier series of lectures dealing with introductory matter, the advanced course was first given last Spring. The new series of lectures began on January 13 and will conclude on April 28, with all lectures being given on Monday evenings from 8:30 to 10:30 p.m. A nominal fee of $12.00 per person is charged and the services of the lecturers are donated. Technical in character, this lecture series was specifically designed for rubber compounders. Those who attended the introductory course were invited to participate in the advanced course. C. E. Carlson (General Tire) is serving as coordinator.

Blast Hits Baytown Plant

► The Baytown, Texas, synthetic rubber plant of the United Rubber & Chemical Co. was struck by an explosion on January 19 resulting in the death of three employees. Firemen from six neighboring cities were called to help quell the fire which followed the explosion. It is reported that one of four steel-reinforced brick buildings on the 47-acre plant site was destroyed by the blast. A second building was damaged and for a time it was feared that the blaze might spread to the adjacent butadiene facility operated by the Humble Oil & Refining Co. United Rubber officials stated that about one-fourth of the plant was either damaged or destroyed. An investigation into the cause of the blast and the resultant fire is now under way.

Harry A. Russell

Elected Vice-President

► Harry A. Russell, formerly technical director, has been elected vice-president of the Pantasote Co., Passaic, N. J. Mr. Russell, who joined the company in 1942, will be in charge of research and development at the company's plant in Passaic and of its divisional plant, the Eleonor Chemical Corp.

Albert Sued for $1,205,000

► Sidney L. Albert has been named in a $1,205,000 damage suit by Edward J. Harris, his corporate partner in the operation of Albert-Harris, Inc., Akron, Ohio. Mr. Harris charges that statements by Mr. Albert have seriously damaged his reputation and business standing. In the early part of 1957, Colonel H. M. Reedall, a stockholder in the firm of Albert-Harris, Inc., filed suit against Mr. Harris charging that Mr. Harris "conspired to divert to himself and another individual", inventions said to be owned by Albert-Harris. Subsequently, a newspaper account of the suit quoted Mr. Albert as saying "all the colonel wants is for the patents to be put back where they rightfully belong, in the corporation." For this statement, Mr. Harris believes he should be allowed $25,000 in damages and $10,000 exemplary damages. He further states that he has spent much of his life creating and perfecting devices for use in the rubber industry, and demands $550,000 on the grounds that due to Mr. Albert's statement he has been unable to sell any portion of his property interest in the inventions. The balance of the $1,205,000 claimed is based on other alleged comment and acts at the time that Colonel Reedall filed his suit. Albert-Harris, Inc. is now in receivership preliminary to hearings on Mr. Albert's demand for liquidation.

Chafee Elected Ansonia President

► John S. Chafee has been elected president of the Ansonia Wire and Cable Co., Ashton, R. I., succeeding Alden P. Lunt, who has resigned. Mr. Chafee was formerly a vice-president of B-I-F Industries, Inc., manufacturer of equipment for control measurement and blending of liquids and industrial materials.

Financial News

Firestone Sales and Profits Hit New High in Fiscal 1957

► According to Harvey S. Firestone, chairman of the Firestone Tire & Rubber Co., Akron, Ohio, sales and earnings of the company for the fiscal year ended October 31, 1957, were the highest in the company's history. In a report delivered at the recent annual stockholders' meeting, Mr. Firestone stated that net income for the year amounted to $61,692,152, which is equal to $7.49 per common share, compared with $60,538,848, or $7.44 a common share, in the preceding fiscal year. The company also reported sales of $1,158,884,304 in the 1957 fiscal year, compared with $1,115,179,738, the year before.

Domestic and foreign taxes on income totaled $58,150,000, against $59,250,000, the year before. Total current assets increased to $513,466,494 from $481,955,745. Profits of foreign subsidiaries were $17,445,456, compared with $13,080,665. The report says that devaluation of foreign to a reserve provided from income in prior years. Expenditures for plant and equipment amounted to $68,768,620, against $58,570,529 the year before. Net working capital on October 31 was $329,064,436, against $321,281,115 a year earlier.

Mr. Firestone stated the "year of 1957 was the second consecutive year that the annual profits of the company exceeded $60 million and the fourth in the last five years that sales amounted to more than $1 million."

The largest program of modernization and expansion in Firestone's 57 year history was carried out during fiscal 1957, he said. For this purpose, a total of $68,768,620 was invested in various parts of the world. Mr. Firestone stated that the company's position for 1958 is excellent. Production facilities had been equipped to turn out more and better products with greater economy and efficiency than ever before.

Among major expansion projects during 1957, the company opened two tire plants, one in Cuba and the other in the Philippines; opened a factory for production of Airide air springs in Noblesville, Ind.; opened the first plant in the Firestone Petrochemical Center in Orange, Texas; acquired the Electric Wheel Co., Quincy, Ill.; bought the U. S. government laboratory for experimental work in synthetic rubber in Akron; opened the "world's largest tire proving ground" at Fort Stockton, Texas, and increased warehouse facilities in Los Angeles, Calif.; Omaha, Neb., and Portland, Ore.

Citing other new developments in the organization, Mr. Firestone said that during 1957 "Our company maintained its position as the world's largest producer of rubber."

Thiokol Chemical

► Nine months to September 30, 1957: Net income of $1,020,218, which is equal to $2.08 a share, compared with $609,598, or $1.35 a share, in the first nine months of 1956. Sales in the first nine months of 1957 totaled $20,715,578, compared with $14,378,464, in the same period of the preceding year. In 1956, Thiokol earned $952,335, or $2.00 a share, on sales of $21,013,527. The company states that it expects earnings of $2.75 to $3.00 a share in 1957, and that income in 1958 will increase about 50 per cent over 1957.

Lee Rubber

► For 1957: Net income of $1,762,581, which is equal to $2.09 a share, compared with $1,612,800, or $1.90 a share, in the preceding year. Sales in 1957 totaled $48,601,093, compared with $46,581,943, in 1956. In an annual report to stockholders, A. A. Garthwaite, chairman of the board stated that "1957 was the second greatest sales year in Lee history".

Midwest Rubber Reclaiming

► Year to October 31: Net income of $817,963, which is equal to $2.71 a common share, compared with $702,687, or $2.29 a share, in the previous fiscal year. Sales in the year to October 31 totaled $9,907,569 compared with $8,928,224 last year.

Introduces Economy Tire

► Firestone Tire & Rubber Co., Akron, Ohio, has introduced the new "Super Champion" replacement tire with construction and design features of the company's more expensive original equipment tire. The economy priced tire in Firestone's passenger car line, the Super Champion sells for approximately 40 per cent less than tires used on new automobiles. Rayon cord is used in the tire body. The new tire is available in conventional tubed construction and is manufactured in 6.00-16, 6.70-15 and 7.10-15 sizes.

Dutch Synthetic Unit Planned

► B. F. Goodrich Chemical Co., Cleveland, Ohio, and Algemene Kunstzijde Unie N.V., Arnhem, Holland, have formed a new company at Arnhem for the manufacture of special purpose synthetic rubber. A plant to be built at Arnhem, scheduled for completion by mid-1959, will produce butadiene-styrene latex; a high-styrene reinforcing polymer, and Hycar nitrile latex. The new facility will be the first plant in continental Europe using Goodrich know-how to produce synthetic rubber.

OTS Issues Three New Reports

► Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., has released three reports pertinent to the rubber industry. The first is entitled *Effects of Rubber Compositions, Rubber Chemicals and Plasticizers Upon Polyethylene*, by S. Axelrod, Picatinny Arsenal, U. S. Army. The report, PB 131091, discusses the tensile strength and elongation of polyethylene, stating that these are generally not affected seriously by contact with rubber compositions. This is indicated in an Army Ordnance study of the effects on the physical properties and serviceability of polyethylene in contact with rubber formulations, rubber chemicals and plasticizers. It is concluded that since rubber polymers themselves do not harm polyethylene, compounds without ingredients known to affect the material individually can be expected to have no adverse effects. However, rubber formulations in which hydrocarbon or ester formulations "bleed" to the surface will adversely affect polyethylene. The report shows that at 77°C. either a coal-tar distillate or stearic acid causes polyethylene to disintegrate. The plastic in contact with different ester plasticizers loses from 1 to 27 per cent of its strength. The 19 page volume was published in 1957 and is priced at 50c.

The second report, PB 131004, is entitled *Temperature Measurements at the Metal Cutting Tip-Shank Interface*, by W. O. Woods, Watertown Arsenal, U. S. Army. According to the report, any bonding materials for ceramic cutting tool tips must retain bond strength at more than 240°F. during machining operations. Adhesives for tips of cemented carbide and high-speed tool steel should withstand temperatures of 250°F. and 270°F. respectively. These observations were made during an Army study of the machining temperatures that adhesives must withstand for effective bonding of cutting tool tips to tool shanks. The data, which could not be found in earlier literature, were gained through newly-devised procedures for determining temperatures at the bond area.

Report PB 121701, the third, deals with the dynamic elastic properties of solids. It contains data accumulated during a six-year study of this subject. Entitled *Dynamic Properties of Solids, Final Report*, by T. R. Cukendall and H. S. Sack, Cornell University for Office of Naval Research, this is a final report of the Navy sponsored project. Consisting of 115 pages, the volume discusses research primarily concerned with determination of the elastic modulus and internal friction of solids under alternating stresses. It is divided into two phases: measurement on metals, mostly single crystals and measurements on plastics and elastomers. The volume was published in November, 1955, and is priced at $3.00.

Jacoby Moves Office

► Ernest Jacoby & Co., Inc., has announced the removal of its office to 585 Boylston St., Boston 16, Mass. The new phone number is Copley 7-9240.

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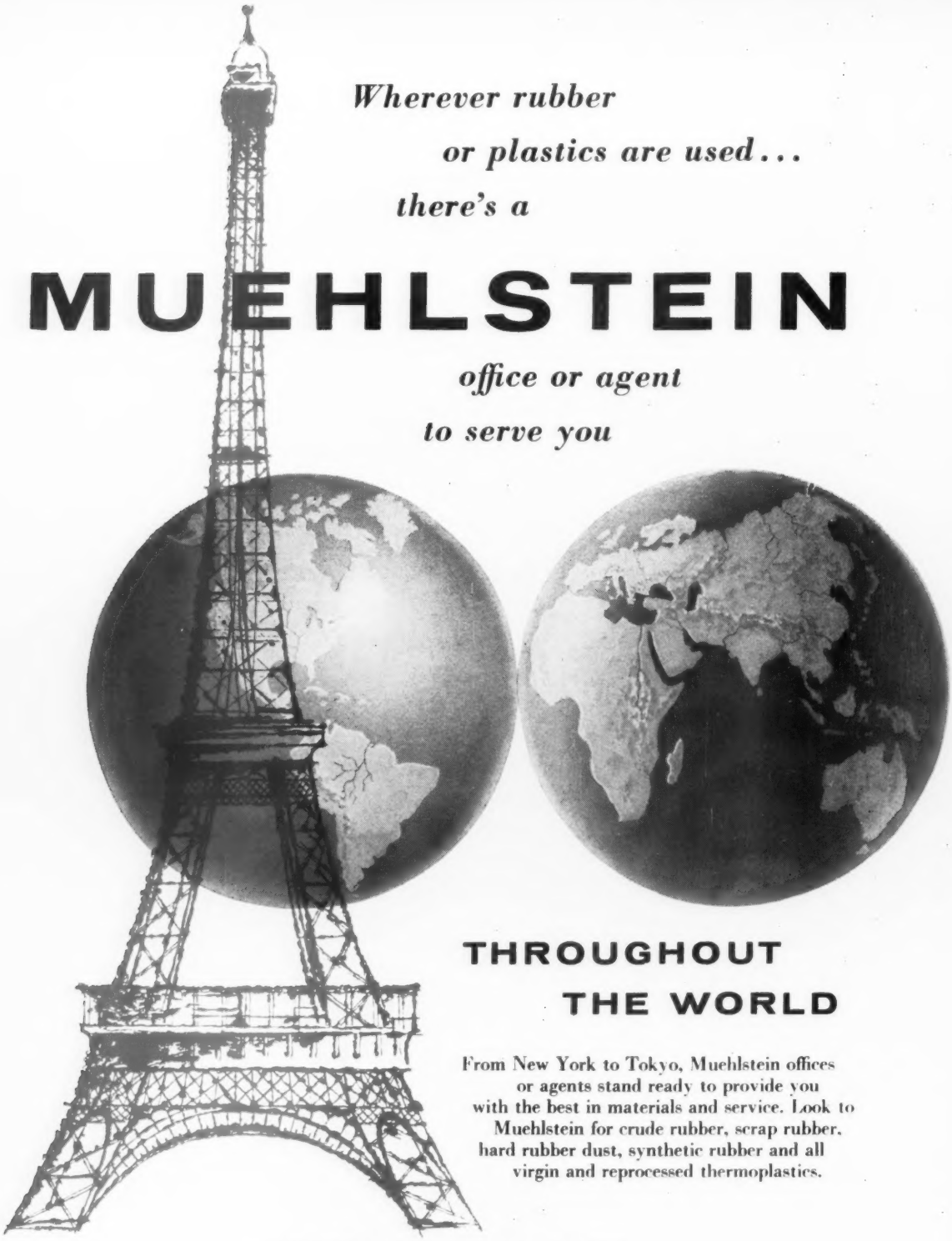

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Discusses Rayon Tire Cord

► A Symposium on "Rayon For Tires — Today and Tomorrow", sponsored by the American Rayon Institute and held at the Portage Country Club, Akron, Ohio, November 21, 1957, featured a talk entitled "Five Ways Best by Test", by J. J. Harrison of Courtaulds (Canada) Ltd. In his talk, Mr. Harrison described tests on rayon cords said to have proven that they are superior to those manufactured with any other competitive textile cord. Mr. Harrison said that rayon cord tires have longer tread life, quieter ride, increased carcass stability, greater heat resistance and an increased mileage yield on subsequent retreading. Five displays of actual tests were used to show the results of experiments.

According to Mr. Harrison, it was found that rayon has 26 per cent more tread life than nylon, which is believed to be due to nylon's tendency to grow. Hi-fidelity audio techniques, used to measure comparative octave noise levels of rayon and nylon cord tires, showed that rayon tires afford up to a 33 per cent quieter ride. Stability tests indicated that rayon is not subject to growth which causes flat spotting, tread splitting and reduced tread life. In an exhibit devoted to heat resistance, representative tire cords of the two materials were exposed equally to controlled heat. Nylon cord disintegrated after 3 seconds' exposure, whereas rayon cord retained its strength until completely carbonized, or 12 to 15 seconds. Retreadability was determined by exposure over the most abrasive road surfaces at speeds averaging 70 miles per hour and climatic conditions exceeding 100° F. It was found that three retreads on a rayon carcass had yielded as much mileage as four nylon retreads. Following impact tests on the two materials, microscopic examination failed to reveal any cord damage on either type of tire. These findings, Mr. Harrison said, led to the adoption of the theme "Five Ways Best by Test" for promotional and advertising campaigns.

Seamco to Produce Polystyrene

► Seamco Chemical Co., Holyoke, Mass., a division of Seamless Rubber Co., will convert styrene into a primary material used to make plastics. El Paso Natural Gas Products Co. and the Rexall Co., parent company of Seamless Rubber, have signed a contract whereby El Paso will provide styrene to Seamco. Produced in liquid form, styrene will be shipped by rail from El Paso's Odessa plant to Holyoke, where the styrene will be converted into polystyrene. The styrene plant at Odessa, now under construction, is scheduled for completion by early spring and will have a capacity of 40,000,000 pounds per year. Styrene produced at Odessa will also be utilized by the General Tire & Rubber Co. in the manufacture of synthetic rubber at the company's nearby plant. The announcement also states that Seamco and El Paso will jointly participate in an extensive research program to develop new and improved plastics. A research laboratory will be constructed at Holyoke for this purpose.

Reclaimers Elect Officers

► The Annual Meeting of the Rubber Reclaimers Association, Inc., held on January 21 at the Hotel Warwick in New York City, featured an election of new officers for 1958. The new officers are: *President*, Thomas H. Fitzgerald (U. S. Rubber); *Vice-President*, John E. Brothers (Ohio Rubber); *Secretary-Treasurer*, Charles T. Jansen (RUBBER AGE). Henry L. Dixon (Goodrich Industrial Products) has been named chairman of the association's Executive Committee, while the Educational Committee will be headed by Chester L. Peterson (U. S. Rubber Reclaiming). The Educational Committee works closely with the local rubber groups to provide speakers for meetings and lectures for the various courses in rubber technology now being offered by groups about the country.

Oppose Synthetic Unit Construction

► The House Constitution and Justice Committee of Brazil have approved a bill introduced by Deputy Antonio Horacio forbidding the setting up of synthetic rubber manufacturing plants in Brazil for ten years. The legislation was introduced despite the fact that Brazil is currently suffering from a shortage of rubber and must rely on imports of both natural and synthetic types. Señor Horacio contends that the legislation would spur rubber planting. Consumption of rubber by new tire factories in Brazil, mostly American, has soared. In 1940, consumption was 4,612 tons. In 1957, it was 37,000 tons and is still increasing. The output of natural rubber has reached an apparently stationary level of about 10,000 tons a year. It is believed that the shortage may soon paralyze some rubber manufacturing industries.

Borne Chemical Announces Rubberized Highway Sealer

► Borne Chemical Co., Elizabeth, N. J., has announced the development of what is said to be a practical process which permits the addition of rubber to coal tar in any proportion. The company explains that the addition of rubber improves the adhesive and thermal characteristics of tar, thus providing a much higher retention of cover stone. Essex County, the largest county in the State of New Jersey, recently seal-coated 270,000 square yards of county highways with the rubber-tar "masterbatch". One-third of a gallon of rubberized material and 25 pounds of cover stones were applied to the square yard. The ease in handling the rubberized tar allowed the contractor to distribute as much as 14,000 gallons in one day. The contractor noted that less binder could be used when rubber was added, and as little as 0.2 gallons per square yard gave good results. Borne Chemical states that the addition of two or three per cent rubber in coal tar greatly reduces the oxidation rate of coal tar, preventing it from becoming brittle on age. This, in turn, results in a superior binder. Borne Chemical serves as distributor for "Rubarite", a free flowing powdered rubber manufactured by the Goodyear Tire & Rubber Co. Rubarite is particularly suited to incorporation into hot-mix tar or asphalt surfacing.

A section of the road recently paved with the new sealer.

Quebec Holds Panel Discussion

► The Quebec Rubber and Plastics Group and the Quebec Section of the Society of Plastics Engineers held their annual combined meeting on January 16 at the Queen's Hotel, Montreal, Que., Canada. The meeting featured a panel discussion on "Plastics versus Rubber in the Footwear and Flooring Industries" with O. R. Huggenberger (Dominion Rubber) as moderator. The panel members included H. Beland (Dominion Rubber), who served as the rubber footwear proponent; C. Lamb (American Biltrite), rubber flooring proponent; A. B. Lewis (British Rubber), plastic footwear proponent, and I. MacLaine (Dominion Oilcloth), who served as the plastic flooring proponent.

Building Georgia Facility

► Anaconda Wire & Cable Co., New York, N. Y., has broken ground for a $1,000,000 plant at Watkinsville, Ga., for the manufacture of a complete line of wire and cable products and accessories. The new building, to be Anaconda's eighth manufacturing plant, will be erected on a 175-acre site. The plant will include facilities for manufacturing as well as warehousing space. Governor Marvin Griffin of Georgia and Richard B. Steinmetz, vice-president of Anaconda, made the principal addresses at the ground breaking ceremonies. The new plant, to employ 100 persons, will be managed by David T. Werner, former district sales manager of Anaconda's office in Charlotte, N. C.

West Coast News

► A new $1.5 million Goodyear Tire & Rubber Co. plant in Sacramento, Calif., to be devoted exclusively to the repair and retreading of giant off-the-road tires, is scheduled to open April 1, according to Robert W. Maney, vice-president of the firm's Western Division. The new plant is located on the Johnston industrial tract, North Sacramento, and is described as an important link in Goodyear's rapidly expanding retread and repair field facilities.

Considered to be one of the most modern and completely equipped retread plants of its kind in the industry, it has facilities to retread off-the-road tires ranging in size from 11.00x24 to giant 29.5x29. The plant also will house ten curing bands for top-capping the big off-the-road tires.

The modernistic one-story building, made of reinforced concrete walls, is 246 feet long and 122 feet wide and embraces a floor area of more than 30,000 square feet. In addition to the modern shop area, the building will house general offices, plant manager's office, cement room, buffing facilities, drying unit, boiler room and convenient shower and locker facilities. The Sacramento plant is the seventh in the company's chain of retread and repair plants.

► Neil R. Pestal has been named chief chemist at the Los Angeles tire plant of the Firestone Tire & Rubber Co. succeeding R. E. Hutchinson, who has retired after 34 years with the company. Mr. Pestal was graduated from the University of Nebraska in 1936 with a degree in chemical engineering. He joined the Firestone organization in 1942 at the company operated Nebraska Ordnance plant. The following year he was transferred to Akron where he was engaged as a rubber compounder for tires. Four years later, Mr. Pestal was transferred to the Los Angeles plant.

Mr. Hutchinson joined Firestone in 1923 as an analytical chemist in Akron. During his career with the company, Mr. Hutchinson was active in the development of the water cure for tubes and in the development of the first set of tires and tubes made from guayule rubber. He was assigned to the Los Angeles plant in 1927. Mr. Hutchinson was graduated from Reed College, Portland, Ore., with an A.B. degree in chemistry. Mr. Hutchinson is now serving as mayor of South Gate, Calif.

► Ralph T. Hickcox, who has contributed to many developments in rubber and plastics during the past 20 years, has been appointed technical director of the Oliver Tire & Rubber Co., Oakland, Calif. Mr. Hickcox, formerly West Coast manager of Goodyear's Chemical Division, is well-known in the paint, paper, textile and ink industries on the Pacific Coast. Filling a new position occasioned by growth of the company and the recent promotion of

Ralph T. Hickcox

Russell D. Kettering who became manager of manufacturing, Mr. Hickcox, as a key member of the staff, will direct the expansion of research and development in the company and its subsidiary divisions.

► A $50,000 investment in new warehousing and retread plant facilities at 1530 S. Alameda St. in Los Angeles has been announced by B. F. Goodrich Tire Co. Included in the expansion is a new 4,300 square foot warehouse building and the installation of additional tire curing equipment in the company's present retread plant at that location. W. S. Seliger, Los Angeles zone manager of the company, said the enlargement is needed to accommodate the growing demand for tire retreading from commercial truck operators and passenger tire users in the Los Angeles area. Mr. Seliger said that the new production equipment is expected to increase the company's tire retreading output at that plant by about 80 per cent.

► Midwest Rubber Reclaiming Co., East St. Louis, Ill., has announced that Howard Erwin has been promoted to superintendent of production for the company's three plants, and will continue as manager of the Paramount, Calif., plant. Charles Hart has been named acting manager to take over responsibilities at the Paramount plant when Mr. Erwin is absent. Mr. Erwin's headquarters will be located at the company's main office, but he will continue to maintain an office at the Paramount plant.

Richardson Promotes Dunlop

► William Dunlop, previously with the company's Indianapolis plant, has been promoted to the Central Research and Development Laboratories of the Richardson Co., Melrose Park, Ill., where he assumes new responsibilities in the Product Development Section.

Copolymer Technical Appointments

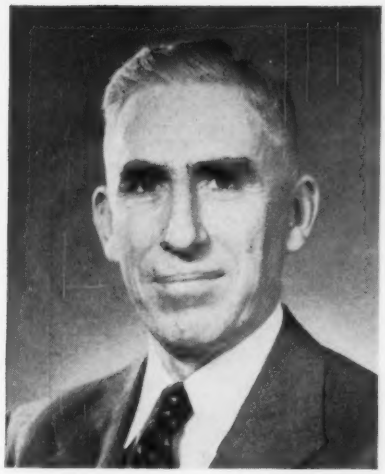
► Copolymer Rubber and Chemical Corp., Baton Rouge, La., has announced three new appointments to the company's technical staff. Robert E. Barrett and J. Robert Olechowski have been named research chemists, while Albert H. Hart, Jr., has been appointed chemist in the Development Division. Dr. Barrett was with Battelle Memorial Institute from 1952 to 1957 and previous to that, he was associated with Visking Corp. Dr. Barrett did undergraduate work at Michigan State University and received an M. S. degree in 1949 and a Ph.D. degree in 1951, both from Ohio State University. He is a veteran of World War II. Mr. Olechowski received his B. S. degree from Canisius College in Buffalo, N. Y., in 1952 and an M. S. degree from Pennsylvania State University in 1955. He expects to complete work for his Ph. D. at Louisiana State University early in 1958. He is a member of the American Chemical Society, Alpha Chi Sigma, Sigma Pi Sigma and Sigma Xi. Mr. Hart formerly served in the Research Department for Monsanto Chemical Co. at the Texas City plant and previous to that was associated with the Army Chemical Corps at Rocky Mountain Arsenal in Denver. He was graduated from St. Edwards University in Austin, Texas, with a B. S. degree in chemistry. Later, he attended Rice Institute Graduate School in Houston for two years.

Neoprene Vulcanizing Process

► A process for continuously vulcanizing neoprene solid and cellular extruded shapes has been developed by the Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc. Called the "LCM Method" (liquid curing medium), it involves passing the extruded section directly into a bath of molten metal or an organic fluid maintained at temperatures of 400° to 600°F. Full vulcanization is obtained in 20 to 30 seconds with most cross sections. The new process will assist manufacturers of extruded neoprene products to reduce manufacturing costs by streamlining production techniques. In addition, improved surface appearance and tolerance control are realized. One concern, using the LCM Method, reported cost savings of 25 per cent over costs by conventional curing methods, DuPont claims.

Buys Biggs Boiler Works

► Union Spring & Manufacturing Co., Kensington, Penna., has acquired Biggs Boiler Works Co., Akron, Ohio, as a wholly-owned subsidiary. The acquisition was made in a cash transaction, according to W. F. McCabe, Union Spring president. Some details of the acquisition, including the price, were not immediately disclosed. Mr. McCabe said the purchase was part of Union Spring's diversification program. Union Spring's steel foundry and Biggs steel fabricating facilities will be merged and the new subsidiary will be operated as the Biggs Steel Foundry and Fabricating Co. under the present management.



Dr. Robert A. Merrill

Promoted By U.S. Rubber

► Dr. Robert A. Merrill, formerly assistant tire production manager, has been appointed assistant director of tire development for the U. S. Rubber Co., New York, N. Y. Dr. Merrill joined U. S. Rubber in 1935 as an engineer in the New Products Department at the Detroit tire plant. He has been manager of process development and assistant manager of the Detroit and Chicopee Falls, Mass., tire plants. The company has also named Francis C. Kennedy manager of tire textile development. Mr. Kennedy was formerly in charge of off-the-road tire development. He is succeeded by Carl F. Engstrom, who will also be in charge of farm tire development.

Ozone Resistant Nitrile Rubber

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has developed what is said to be the first nitrile rubber to resist ozone cracking. According to the company, compounds of "Hycar 1072" nitrile rubber can be made which are unaffected by ozone during an extended test period, even when the compounds are soaked in hot oil before exposure to ozone. The product also has superior oil resistance, good flexibility, high strength and exceptional resistance to abrasion and oxidation, Goodrich claims. In company tests, a Hycar 1072 compound, after immersion in ASTM No. 1 oil for 70 hours at 212° F., showed excellent resistance to ozone exposure, and a Hycar 1072 compound containing an added anti-ozonant showed excellent resistance to ozone both before and after immersion in hot oil.

To Handle Durez Phenolic Resins

► Durez Plastics Division of the Hooker Electrochemical Co., North Tonawanda, N. Y., has appointed Akron Chemical Co., Akron, Ohio, to handle the sales and service of the firm's phenolic resins for the rubber industry in Ohio, Indiana, Michigan, western Pennsylvania and western New York. Akron Chemical maintains a technical service laboratory and warehouse facilities at Akron.

Appointed Manufacturing Manager

► Industrial Chemicals Division, American Cyanamid Co., New York, N. Y., has appointed J. Ray Coulter as manager of manufacturing. He will be responsible for the supervision of manufacturing activities of the division's 15 plants which produce a wide variety of chemicals and chemical intermediates for the paper, petroleum, metal processing, plastics, and other industries. Mr. Coulter, who joined Cyanamid in 1955, was previously manager of manufacturing for the Phosphates and Nitrogen Division, and served as a partner in Coulter, Harden and Co., a firm of consulting management engineers. A graduate chemical engineer from Montana State College, Mr. Coulter has held posts as an administrator and consulting engineer with several chemical and mining companies including the Combined Metals Reduction Co. of Salt Lake City. Prior to the war, he worked eleven years with Anaconda Copper's European operations and during the war years was in charge of all production activities of Basic Magnesium, Inc. Mr. Coulter holds membership in the American Institute of Chemical Engineers and the American Institute of Mining, Metallurgical and Petroleum Engineers.

SPI Standard in Wide Use

► Society of the Plastics Industry, New York, N. Y., reports the Plastic Garden Hose Standard, CS 209-57, established by the Department of Commerce in April, 1957, is being used extensively on standard quality plastic garden hose by manufacturers throughout the country. A "Seal of Quality" is displayed on plastic garden hose meeting the requirements of the standard. The test procedures and requirements contained in the standard were developed by the manufacturer members of SPI in order to provide basic quality requirements that would insure the user of a satisfactory product. This industry standard incorporates requirements and test methods for vinyl chloride plastic garden hose in respect to burst strength, low-temperature flexibility, water extraction, performance of couplings. The standard also contains dimensions and tolerances on this product.

Minnesota Rubber Buys Tool Firm

► Minnesota Rubber Co., Minneapolis, Minn., has announced the purchase of the Park Tool Co., a tool and die manufacturing firm located in suburban Minneapolis. The purchase involved total assets of Park Tool, which will be merged with the parent organization. Facilities of Park Tool will be used to expand the capacity of Minnesota Rubber's Tool and Die Division. William Ecoff, owner and manager of Park Tool, will join Minnesota Rubber as manager of the Tool and Die Division and will also be in charge of metal research. The new purchase is the second major acquisition by Minnesota Rubber in the last 10 months. In March, 1957, the firm purchased General Industrial Products, Inc., which now operates as the company's Plastics and Latex Division.

James M. Kyte, Jr.

Elected Coated Products President

► James M. Kyte, Jr., formerly general manager and secretary, has been elected president of Coated Products, Inc., Bound Brook, N. J. Mr. Kyte joined the company four years ago. The company has also announced the election of William Piltz as a member of the board of directors, Ralph Bates as secretary and James M. Kyte, Sr., as treasurer.

Truck Tire Prices Raised

► Goodyear Tire & Rubber Co., Akron, Ohio, announced a price increase of from 3 to 5 per cent on some lines of truck tires on January 22, with the increases taking effect on February 1. All 7.50 and larger flat base and tubeless equivalent Traction Hi-Miler truck tires are being increased in price approximately 5 per cent. All 16.00 and 18.00 cross-section Hard Rock Lug tires are being increased by 3 per cent. The increases are necessary, the company said, to bring the selling price of these tires in line with costs. About one week after the Goodyear announcement, the General Tire & Rubber Co. of Akron, Ohio, also announced similar increases on its truck tires. Some General Tire giant-size casings have been increased by 13 per cent, with other price increases falling within the 3 to 5 per cent range. The trade expects other producers to announce similar price changes within the next few weeks.

Joins Velsicol International

► Velsicol International Corp., C. A., Nassau, Bahamas, has announced the appointment of Bernard Willis to handle liaison with U. S. suppliers for world wide distribution. Headquarters will be located in New York City. Velsicol International markets outside the United States complete lines of insecticides and industrial resins and solvents. Before he joined Velsicol International, Mr. Willis was with a chemical marketing firm, where he worked closely with leading chemical manufacturers. He is a member of the Institute of Directors (London) and the Chemical Institute of Canada.

Canadian News

► Canadian Industries, Ltd., has announced that a new hydrogen peroxide plant at Hamilton is now on stream. Located on the site of the company's Hamilton works, the plant is C-I-L's second hydrogen peroxide plant. The other is located at Shawinigan Falls, Que. The new unit boosts the company hydrogen peroxide production facilities to provide fully for all present Canadian requirements and for the foreseeable future. The facility consists of approximately 30,000 square feet in two complete floors and three additional partial floors. It has a structural steel framework and asbestos siding. The electrolytic process and other features of the new unit are said to represent the newest and most efficient design for maximum economy in production. Patent license agreements with the Becco Chemical Division of Food Machinery and Chemical Corp., whose process is used, provides C-I-L with full use of that company's technical service facilities. C-I-L has also established a research and development unit in its own central research laboratory at McMasterville, Que.

► The eighth Canadian High Polymer Forum will be held May 12-14, 1958, at MacDonald College in Quebec. A feature of the Forum banquet, scheduled for Monday, May 12, at the Larry Moquin Hotel, Ste. Anne de Bellevue, will be an address by Professor Gee of the University of Manchester, who will speak on "Predicting Polymer Properties". Members who plan to present papers should send titles to the program chairman, Dr. M. H. Jones, Ontario Research Foundation, 43 Queen's Park, Toronto 5, Ont., before March 1, 1958. To ensure inclusion in the program, abstracts of approximately 300 words must be received not later than March 31, 1958. Reservations for accommodations in the College dormitories are now being accepted by Dr. E. B. Bagley, Central Research Laboratory, Canadian Industries, Ltd., McMasterville, Que. Motels, located within five miles of MacDonald College, will accommodate those requiring off-campus accommodations.

► T. H. Glynn Michael has been appointed general manager and secretary of the Chemical Institute of Canada, succeeding Garnet T. Page, who has joined the Engineering Institute of Canada in Montreal. Mr. Michael will also serve as managing editor of the C. I. C. publications *Chemistry in Canada* and the *Canadian Journal of Chemical Engineering*. Educated at Upper Canada College, Toronto and the University of Toronto, Mr. Michael received a B. A. degree in chemistry in 1940. He then took a course in business administration at the same university. Mr. Michael was formerly director of research for Howards & Sons (Canada) Ltd., Cornwall, Ont. Previous to that, he was successively a staff member at the Ontario Research Foundation, the National Research Council and Woburn Chemicals, Ltd.

► Black polythene film has been used to line sewage lagoons in Montreal, Que. The lagoons, 14 feet deep and 250 feet square, were constructed to store sludge during the winter months. They were lined at a cost of $6,000 as opposed to an estimated cost of $50,000 for asphalt lining. The film was extruded by Polychemical Industries, Ltd., in Edmonton, from a polythene compound containing carbon black.

► John C. de Belle has been appointed technical service representative for the Chemicals Division of Canadian Industries, Ltd. He will make his headquarters at Toronto and will provide technical assistance to the dry cleaning industry in that area. A native of Montreal, Mr. de Belle joined C-I-L in 1953 after graduating from McGill University with a B. S. degree.

► Dow Corning Silicones, Ltd., Toronto, Ont., has been appointed the Canadian distributor for the Alpha-Molykote Corp., Stamford, Conn. Alpha-Molykote states that Dow Corning's lubrication know-how will be of considerable value to the company's customers in Canada.

Karl L. Rohde, Jr.

Named Sales Representative

► Karl L. Rohde, Jr., has been appointed sales representative for organic chemicals by the Organic Chemicals Division of Dewey and Almy Chemical Co., Cambridge, Mass. Mr. Rohde, who graduated from Harvard College in 1947, was previously sales and advertising manager for Precision Metals Products, Inc., Stoneham, Mass. He has also served on the sales staff of the G. D. Searle Co., Chicago, Ill. Mr. Rohde is a member of the Society of Plastics Engineers.

Dayton Forms Urethane Division

► Formation of a new division to be called the Urethane Division, with production facilities in Marietta, Ohio, and Hawthorne, Calif., has been announced by the Dayton Rubber Co., Dayton, Ohio. Formed as a result of the rapid expansion of sales in the plastic foam field, the division will market all of Dayton's plastic foam products, or polyesters and polyether urethanes under the trade name of "Stafoam". Production facilities have been expanded for the newly formed division, which has stepped up production to cover the entire urethane output in both flexible and solid types. Plastic foams, or urethanes are formed by precise proportioning of basic chemicals and the resulting plastic foam can be made as soft as sponge rubber or as hard as ivory.

Beebe Rubber to Expand

► Beebe Rubber Co., Nashua, N.H., expanding for the third time in the past two years, will add over 10,000 square feet to the main plant. The firm will install new presses and mills, plus additional molds. The increased production capacity and floor space was made necessary by the popularity of "Ripple" soles, as well as soling slabs and heels. Heavy samplings and tests being made on the pre-molded Anchor Sole by leading shoe manufacturers has made it necessary for Beebe to build at this time, according to company officials.

Anchor Rubber Changes Name

► Anchor Rubber Products, Inc., and Doan Manufacturing Corp., have combined to become divisions of Anchor Industries, Inc., Cleveland, Ohio. The Anchor Rubber and Doan Manufacturing Divisions will retain their individual identities and continue with their established sales policies. The consolidation is a move toward greater expansion and to facilitate product diversification, the company stated. In two newly-created posts on the board of directors, I. A. Kravitz has been named executive vice-president, sales, and Walter S. Lepene was named vice-president, sales.

Goodyear Chemical Transfers Smith

► Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio, has announced the transfer of C. H. Smith from the Philadelphia to the Minneapolis field office as a special representative. Mr. Smith joined the company in 1955 with six years previous experience in the paint industry. He was graduated from North Dakota State College with Bachelor and Master of Science degrees in protective coatings. Mr. Smith is an active member of the Louisville Paint and Varnish Production Clubs, the American Chemical Society and the American Society for Testing Materials.

Thomas G. Gibian

Gibian Named General Manager

► Thomas G. Gibian has been named general manager of the Organic Chemicals Division of the Dewey and Almy Chemical Co., Cambridge, Mass., succeeding Russell L. Haden, who has joined the Virginia-Carolina Chemical Corp. Mr. Gibian will also continue as general manager of the firm's Battery Separator Division. A graduate of the University of North Carolina with a B.S. degree and the Carnegie Institute of Technology with a Ph.D., Mr. Gibian joined Dewey and Almy in 1951 as a development engineer after serving as a research chemist with the Atlantic Refining Co. He was manager of the Battery Separator Division's Acton, Mass., plant before his appointment as general manager of that division in 1956. Mr. Gibian is a native of Prague, Czechoslovakia, and came to the United States shortly before World War II. He served as a fighter pilot with the Royal Air Force in England, then returned to the United States, becoming a citizen in 1948. He is a member of the American Institute of Chemical Engineers and the American Chemical Society.

Expands Production Facilities

► New plant expansion at the Rubber & Asbestos Corp., Bloomfield, N. J., has resulted in the availability of rubber and resin milling and dissolving facilities on a "custom order" basis. The company's current equipment includes a battery of 3,000-gallon churns which permits the manufacture of one uniform batch of material in up to truckload quantities. Rubber & Asbestos officials state that 45 years of experience in milling and dissolving rubber and resins insures the ability to handle the most critical and confidential requirements of the rubber and plastics industries. The expansion of manufacturing facilities will enable Rubber & Asbestos to accept outside contracting for specialized milling and dissolving operations in volume.

NCG Forms New Equipment Division

► National Cylinder Gas Co., Chicago, Ill., has announced major changes in the company's organizational structure which include the formation of a separate division to supply automatic continuous processing equipment to the rubber, food, plastics, chemical, textile and other industries. John E. Slaughter, Jr., has been appointed president of the new Girdler Process Equipment Division, which produces "Votator" and "Thermex" equipment, and Lyman L. Dawson has been named vice-president. Mr. Slaughter became associated with the Girdler Co. in 1934, serving in its New York office until 1938, when he was named general sales manager. He was elected a vice-president of Girdler in 1943 and has been in charge of the Votator Department of the Girdler Company Division of NCG. Mr. Dawson joined Girdler in 1929, became vice-president in charge of the Votator equipment operations in 1935 and has been in charge of Thermex equipment operations since 1942.

Other new divisions are the NCG Division, with J. L. Adank as president and Fred C. Heppel as executive vice-president; the Girdler Construction Division with W. Roberts Wood as president, and the Chemical Products Division with Walter H. Girdler, Jr., as president. The company has also announced formation of a new foreign subsidiary, the NCG International, with Fred C. Heppel as president. It will operate the company's gas-producing business in Canada, Venezuela, Colombia and other countries.

Glacial Acrylic Acid Unit

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has announced that a new facility for making glacial acrylic acid in large commercial quantities is nearing completion at the company's Calvert City, Ky., plant. Located on a 2½ acre portion of the company's Calvert City site, the new unit is expected to be on stream in early 1958 and will have a capacity of several million pounds of glacial acrylic acid per year. Availability of the glacial product on this scale will offer important handling advantages to manufacturers now using water solutions of acrylic acid, the company states. The new plant, said to be the first of its kind in the country, will be integrated for the production of acrylic resins as well as the acid. Related chemicals to be produced include "Good-rite TS-20", a processing size for nylon; "Good-rite CB-35", a foundry corebinder, and additives for pharmaceutical, cosmetic and latex paint formulations.

Page Named Director of Research

► Dr. Robert M. Page, previously associate director of research for electronics, has been named director of research at the Naval Research Laboratory. In his new post, Dr. Page will direct a program of fourteen fields of the physical sciences. He holds thirty-eight patent grants and has twenty-nine applications pending. The patents cover basic elements of radar.

Donald L. Johnson

Appointed Witco Representative

► Donald L. Johnson has joined the sales staff of the Witco Chemical Co., New York, N. Y. Mr. Johnson will be a sales representative for the Organic Chemicals and Rubber Chemicals Divisions with headquarters at the company's San Francisco office. Mr. Johnson was formerly associated with E. I. du Pont de Nemours & Co., Inc., as a paint chemist, and with California Ink Corp. as a technical representative. A captain in the United States Army during World War II, Mr. Johnson attended the University of California.

Goodyear Tire Names Two

► Richard L. Miller and Robert E. Sheldon have been elected as assistant secretaries by the board of directors of Goodyear Tire & Rubber Co. Mr. Miller, patent counsel, is a graduate of Purdue University and Akron Law School. He joined Goodyear in a staff training course in 1928, was transferred to the company's Patent Department in 1931 and later was appointed secretary to the chairman of the board. In 1943, Mr. Miller was named assistant secretary of Goodyear Aircraft Corp., returning to the tire company in 1947 as assistant patent counsel. He is a member of the American Bar Association and the American Patent Law Association. Mr. Sheldon, assistant general counsel, has been a member of Goodyear's Law Department for 35 years. He specializes in the fields of government contracts, corporation finances, taxes, and is in charge of the Law Department. Mr. Sheldon attended Ohio Northern University and graduated from Akron Law School. He holds memberships in the Akron and Ohio State Bar Associations.

Stops Polyester Resin Production

► Bakelite Co. has withdrawn from the manufacture and sales of polyester resin. However, the company will continue to develop, manufacture and promote epoxy and phenolic resins for use in reinforced plastics.

Obituaries

Albert E. Cleghorn

► Albert E. Cleghorn, president of the National Aniline Division of Allied Chemical and Dye Corp., New York, N. Y., died, apparently of a heart attack, on January 9. He was 52 years old. Mr. Cleghorn was appointed president of National Aniline on October 21, 1957, and assumed charge of the division on November 1. Born in Hot Springs, S. D., Mr. Cleghorn attended Wesleyan University, Middletown, Conn., and received a bachelor's degree in chemical engineering from Brooklyn Polytechnic Institute in 1928. He taught chemistry at Long Island University and later joined Foster D. Snell, Inc., consulting chemists and engineers in New York. Within three years, he was named an associate consultant. In 1933, he became associated with Allied Chemical, serving with the home office staff. He was placed in charge of the general accounting department in 1943 and became assistant controller eight years later. Mr. Cleghorn was assigned to National Aniline in 1952 and was successively assistant to the president, vice-president and executive vice-president, before he was named president. Mr. Cleghorn was a member of the board of governors of the Synthetic Organic Chemical Manufacturers Association. He was also a member of the American Chemical Society and the Downtown Athletic Club. Mr. Cleghorn is survived by his wife and a son.

John H. Merrell

► John H. Merrell, honorary director of Raybestos-Manhattan, Inc., died on January 4, in Chicago, Ill. Mr. Merrell started with the Manhattan Rubber Manufacturing Co., now the Manhattan Rubber Division of Raybestos-Manhattan in 1903 at the Chicago branch office as manager of the Solid Carriage Tire Department. He became successively Chicago branch manager, vice-president and director of Raybestos-Manhattan, Inc.

O. E. Lohrke

► O. E. Lohrke, sales manager of the Metasap Chemical Co., a subsidiary of Nopco Chemical Co., Harrison, N. J., died on December 20. Mr. Lohrke was born in 1894 and joined Metasap in 1923. In the 34 years that he was with the organization, he was a major force in its growth.

C. Dudley Clawson

► C. Dudley Clawson, president of the Ferro Corp. of Cleveland, Ohio, died on January 4, while on a vacation in Mexico City. He was 55 years old. President of Ferro since 1947, Mr. Clawson was named president of Tuttle and Kift, the Ferrod Corp. and the Ferro Electric Corp., subsidiaries of the Ferro Corp., in 1954.

Joseph J. Catterall

► Joseph J. Catterall, assistant secretary of the Rubber Manufacturers Association, died of a heart attack on January 18 at his home in South Orange, N. J. He was 55 years old. Mr. Catterall was born in Berwick, Penna., and worked there for the American Car and Foundry Co. until the firm transferred him to New York about 30 years ago. He joined the Rubber Manufacturers staff 20 years ago and has served as secretary of the Mechanical Goods Division; the Management Committee, the Industrial Rubber Goods, Latex Foam, Corrugated Matting, O-Ring, Stair Tread, Tape, Thread, V-Belt, Urethane Foam, and Molded, Extruded, Lathe-Cut and Chemically Blown Sponge Rubber Subdivisions, and the Hard Rubber Goods Division. Mr. Catterall is survived by his wife and two sons.

Leland K. Spink

► Leland K. Spink, engineer in charge of flow measurement at the Foxboro Co., Foxboro, Mass., died on December 23 in Foxboro, Mass. Mr. Spink was 58 years old. Educated at the University of Kansas and the University of California, Mr. Spink started his career in flow measurement at Foxboro's Tulsa branch in 1924 and later became recognized as an authority in the field. He was the author of several flow measurement texts, including the "Handbook of Steam Flow Measurement and Principles and Practice of Flow Meter Engineering."

Announces Executive Realignment

► Adrian R. Fisher has been named chief executive officer of the Johns-Manville Corp., New York, N. Y., in a realignment of executive responsibilities following the retirement of Leslie M. Cassidy, chairman. Mr. Fisher has been named chairman of the board and continues as president and director. Mr. Cassidy will continue as a director and will be available to the management as a consultant. The board has also created the new office of executive vice-president. Clinton B. Burnett has been elected to this post and has also been made a director. Mr. Fisher, who joined Johns-Manville as superintendent of the Asphalt Roofing Department at the Waukegan, Ill., plant in August, 1923, has since served in every phase of the company's operations and has been a senior officer for 20 years. Mr. Burnett joined the company in 1931 in the Planning Department at Waukegan, Ill., and has gained wide experience in production, engineering and administration. During World War II, Mr. Burnett was operating manager of the Kansas Ordnance Plant, Parsons, Kan., which Johns-Manville built and operated for the government.

Carboline Moves To New Facility

► Carboline Co. has announced the removal of the company's general offices and research laboratory to a recently completed building located at 32 Hanley Industrial Center, St. Louis 17, Mo. Containing almost three times the space of their old location, the new laboratory is of modern construction. The area is divided into bays for individual group development work with each research bay designed for groups of four men. Among the innovations are an application research department with all types of industrial equipment now available for coating applications. A large section of the laboratory is devoted to the testing department. The Carboline laboratory is believed to be the first laboratory in the country to have developed simulated industrial corrosive atmospheres for accelerated testing of coatings. After over two years of development work, the company has found that these simulated atmospheres duplicate industrial atmospheres in chemical plants but with accelerated rates of 10 or even 20 to 1. The rear roof of the building is designed with a flat deck area, where coated panels are supported on test racks for actual weathering evaluation. The new building was designed so that additional expansion facilities can be added.

Plastics Exhibitors Increase

► The Eighth National Plastics Exposition, sponsored by the Society of the Plastics Industry, Inc., and scheduled to run from November 17 through 21, 1958, at International Amphitheater, Chicago, Ill., has received advance registration 50 per cent ahead of registrations received at the same time for the last Chicago show which was held in 1950. The number of exhibitors signed up, 165, already exceeds the total number of exhibitors registered for the previous Chicago Plastics Exposition. It is believed that more than 200 companies will exhibit at this show, which will provide representatives of business and industry with a look at all phases of the $2,000,000,000 plastics industry. A national Plastics Conference will be scheduled at the same time at the Hotel Morrison which will also be the headquarters hotel for the plastics industry during that week.

Bearflex 1751 Available

► The Chemicals Division of the Golden Bear Oil Co., Los Angeles, Calif., has announced the commercial availability of "Bearflex 1751", a low cost liquid hydrocarbon resin said to have high compatibility with polyvinyl chloride. Bearflex 1751 is the first of a series of products for the plastics industry to be manufactured by the company. A blend of 70 per cent Bearflex 1751 and 30 per cent DOP is said to give a plasticizer system compatible in all proportions with polyvinyl chloride resin. According to the company, physical properties compared to a 100 per cent DOP compound are not affected appreciably and electrical properties are improved.

Washington Hears Sackett

► The January 15th dinner meeting of the Washington Rubber Group, held at the Naval Gun Factory Officers' Club in Washington, D. C., featured an address by George A. Sackett, director of repair material for the Armstrong Rubber Co., who spoke on "Tubeless Tire Care and Repair." Mr. Sackett stated that most of the troubles with tubeless tires can be removed by properly instructing retreaders, garage men and service station men, thereby eliminating some of the misapprehensions many of them have in regard to tubeless tires. The speaker observed that one of the major problems with tubeless tires is separation. It is indicated that tire heat developed after long driving periods at high speeds is probably the major cause. Since driving habits cannot be changed, other means must be found to overcome this difficulty which, incidentally, affects tubed tires as well. Mr. Sackett recommends a dual program of educating the public as well as retreaders, garage men, etc. The public should be educated to have periodic inspection of their tires through a program planned by the Rubber Manufacturers Association. Garage and service station operators should be taught the operating advantages of tubeless tires as well as the methods of inspection of tires and rims, and the proper technique for making simple repairs with plugs and patches. Retreaders should be educated in inspection, thorough preparation of a tire, venting technique, and sound methods of repair before retreading is done. Mr. Sackett demonstrated the tools and equipment used in making tubeless tire repairs.

Installs Tire Cord Unit

► Cooper Tire and Rubber Co., Findlay, Ohio, has put into operation what is termed the industry's newest and most advanced nylon processing mill for tire cord. A Cooper spokesman said the cost of the new equipment and installation amounted to nearly $1 million. Prior to the installation of the equipment, Cooper had purchased ready-processed nylon tire cord from its suppliers. Cooper officials expect the new equipment will permit the company to do a more uniform and controlled job of treating nylon at considerable savings in costs. The installation of this equipment, it was noted, is in keeping with the phenomenal growth of the Cooper organization. Seventy-five per cent of the existing plant structure has been put up since 1943, and company sales have multiplied about seven times.

Trotter Buys New Jersey Firm

► E. T. Trotter Co., Brooklyn, N. Y., manufacturer of products for the electrical wire and cable industry, has acquired the Allied Asphalt & Mineral Corp., Dunellen, N. J., compounders of pitches, plasticizers, gilsonite and tailor-made waxes. Terms of the transaction were not disclosed. Trotter plans to transfer its Brooklyn facilities to the Allied Asphalt and Mineral's plant in Dunellen.

Brunswick-MacGregor Plan Merger

► Brunswick - Balke - Collender Co., Chicago, Ill., has moved to acquire MacGregor Sports Products, Inc., producer of athletic and sporting goods. Brunswick has notified MacGregor shareholders that it would exchange one share of Brunswick common for each share of MacGregor. The exchange offer would require the acceptance of holders of 90 per cent of MacGregor's 163,500 outstanding shares. Brunswick had 1,225,361 shares of common outstanding on December 31. Complete acceptance of the exchange offer by MacGregor stockholders would involve Brunswick stock valued at $5,436,375, the company stated. The two companies announced that they were considering the feasibility of a merger since last August.

Producing Tires For Foreign Cars

► U. S. Rubber Co., New York, N. Y., has begun the domestic production of tires for foreign cars imported into this country. The tires will be of tubeless construction, will range from 12 to 16 inches in diameter and will fit the rims of 85 per cent of the car makes being imported. At present, the company is supplying tires on a limited basis to car dealers selling the English Ford, Vauxhall and Opel and the Swedish Volvo, from stocks sent here by the company's British subsidiary, the North British Rubber Co., Ltd. Tires manufactured here will be marketed by U. S. Rubber's independent tire dealers. This year, it is estimated, foreign car sales will total 200,000, as against 98,000 in 1956. In 1955, sales were 58,460.

Opens New Pentaerythritol Plant

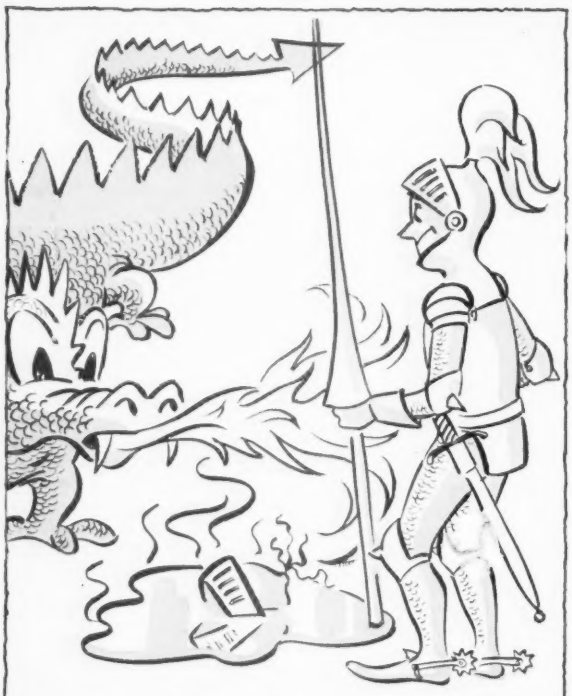
► Heyden Newport Chemical Corp., New York, N. Y., producer of "Pentek", a pentaerythritol used in the production of weather resistant, quick drying paints, enamels, resins and other surface coatings, has announced the opening of an automated continuous - production plant at Fords, N. J. The new plant produces 25 million pounds of the industrial chemical annually when operating at full capacity. The Fords plant is part of a major expansion program involving capital expenditures of approximately $25 million dollars in the past five years. The company also reported that another new facility at Fords for the production of salicylaldehyde will shortly be completed. A new catalytic processs, representing a departure from methods of production now used, is incorporated in this facility which will produce over a million pounds of salicylaldehyde a year.

Overbeek Joins Michigan Chemical

► Michigan Chemical Corp., St. Louis, Mich., has added Donald E. Overbeek to its research staff, according to the announcement of Dwight Williams, director of research. Dr. Overbeek was recently with Stauffer Chemical Co. at Chauncey, N. Y., as a research chemist. He is a graduate of Kalamazoo College and obtained his doctor of philosophy degree in organic chemistry at the University of Michigan. He is a member of the American Chemical Society, Sigma Xi, and Phi Lambda Upsilon. He is currently assigned to the development of new organic chemicals.

St. Joseph Lead Holds Sales Conference

► On October 28th, the St. Joseph Lead Co. conducted a two-day meeting for its zinc oxide sales personnel at the Pittsburgh Airport Hotel, Pittsburgh, Penna., with about fifty sales representatives and technicians from the company's Josephtown, Penna., zinc smelter in attendance. The October 28th session was technical in nature and was conducted by company technicians under the direction of J. J. Rankin, production engineer. On October 29th, R. H. Crossley, manager of zinc oxide sales, led a discussion on sales problems. Following this, the group visited the Josephtown Zinc Smelter near Monaca, Penna., and inspected its various laboratories and the nearby paint test fence site. Of considerable interest to the group were St. Joe's direct Reading Spectro-meter and Electron Microscope, both valuable new tools in research, development and the quality control of zinc oxides for use in the rubber, paint, ceramic and other industries.



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For further information and samples—write MERCK & CO., INC., Marine Magnesium Division, Department 12, Rahway, N. J.

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Overseas

by Comtel-Reuter

Ravenna—Anic Company's synthetic rubber and nitrogenous fertilizer plant will soon go into production. The factory, part of the ENI group, will have an annual capacity of some 35,000 tons of synthetic rubber and 65,000 tons of fertilizers. An extension is contemplated to produce butadiene from butane and styrol, which will enable synthetic rubber production of 55,000 tons.

Kuala Lumpur—A new high quality Malayan rubber is said to have been developed. It is claimed that the new variety, called "Superior Processing Rubber" could cut the cost of manufacture of rubber products. Superior Processing Rubber was developed by the Rubber Research Institute in collaboration with the British Rubber Producers Research Association in England.

Duesseldorf—West German engineers have developed a new type of conveyor belt made of rayon and Perlon and covered with a layer of rubber on one or both sides. It is said to be exceptionally durable and to possess great tensile strength.

Singapore—Plans to set up a Pan-Malayan Rubber Association are being drafted by a subcommittee appointed by the Singapore Chamber of Commerce Rubber Association and the Rubber Traders Association. It is believed that formation of such an organization will enable traders and producers to bargain "with one voice" in the international market.

Djakarta—The United States International Cooperation Administration will give aid to help Indonesia replant rubber. Under this plan, Indonesia will receive ten million rupiahs for new rubber planting and replanting.

Colombo—The Ceylon Cabinet has decided to go ahead with a proposal to nationalize the Port of Colombo as a means of resolving the labor unrest which has caused congestion and constant stoppage of work.

Moscow—A method of producing ethyl-alcohol—a basic material for synthetic rubber production—out of hydrogen and carbon dioxide has been developed by the Petroleum Institute of the USSR Academy of Sciences. The new method promises to be very economical.

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AND COSTS LESS! THANKS TO ENJAY BUTYL!

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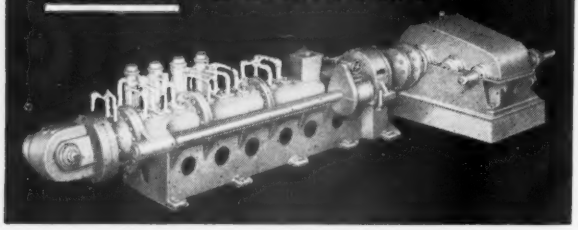

the RECLAIMATOR process is now available on a licensing basis *all over the world.*

This is the only continuous and completely DRY process for reclaiming rubber. From beginning to end, devulcanization in the RECLAIMATOR takes only 3 minutes. Because of this short cycle time more of the desirable properties are left in the rubber. And . . . this process is AUTOMATIC and electrically controlled — no steam plant is required.

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OVERSEAS (CONT'D)

Karlsruhe—The West German subsidiary of the French Michelin rubber combine will resume production after a 20 year interval, the company's management has announced. About 30 million marks will be invested to resume work at the plant. At first, only truck tires will be produced.

Kuala Lumpur—An eleven man joint committee from the Malayan government and the rubber industry met recently to discuss plans for a program of intensive research into Malayan rubber production. The preliminary discussion dealt with recommendations of the Blackman Committee, an advisory committee which studied the competitive positions of natural and synthetic rubber in 1956.

Stockholm—The Swedish Rubber Workshop and Tyre Associations have announced a five per cent cut in the price of tires, effective immediately. The Associations represent the greater part of Swedish retail tire trade.

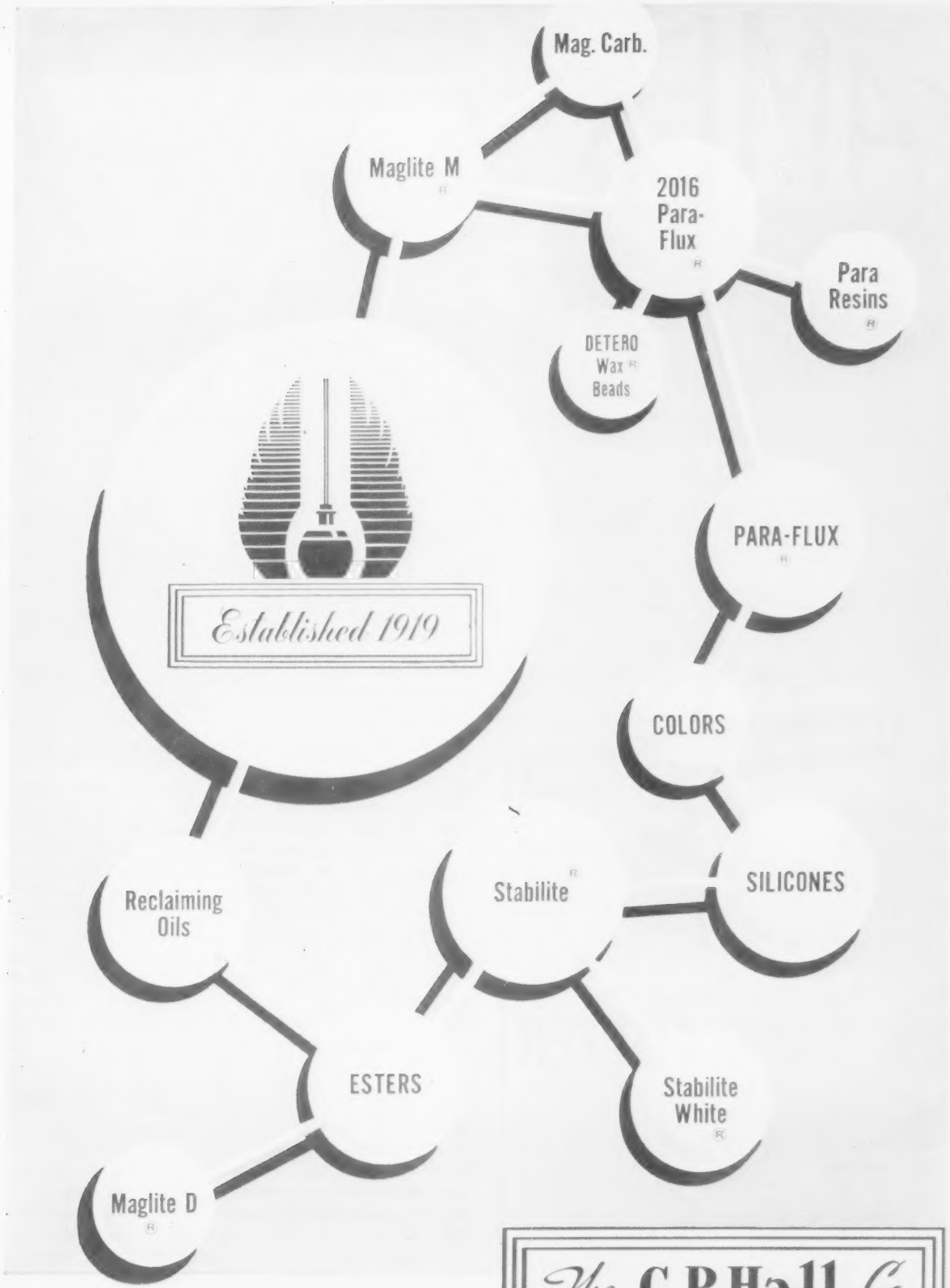
Singapore—Three Singapore Unions, which claim to represent 7,000 workers, will ask the government to restrict imports of cheap rubber goods into the colony. Rubber footwear manufacturers and workers protest that the import of rubber shoes from Hong Kong and Japan is undercutting their prices and forcing them out of business.

Papua—Development of the rubber industry in Papua to a stage where it will be of strategic importance to the nation is forecast by the Australian Territories Minister. Papua is already producing 4,000 tons of rubber a year.

Jerusalem—Alliance Tire and Rubber Co., Ltd. of Israel, plans to start rubber plantations in Western Nigeria and possibly also in Ghana in order to assure supplies for its Hedera plant. The plantation would be started in cooperation with the Dayton Rubber Co., Dayton, Ohio, with whom Alliance has a technical service agreement.

Colombo—Russia is willing to assist Ceylon set up a factory for the manufacture of tires, tubes and allied rubber products. A Soviet delegation is in the closing stages of discussion for the finalization of trade and payments agreements for strengthening trade and economic relations between the two countries.

Kuala Lumpur—The Malayan Government has lifted the embargo recently placed on the export of rubber seeds. A government statement says the ban has been lifted because smallholders' requirements can now be met.



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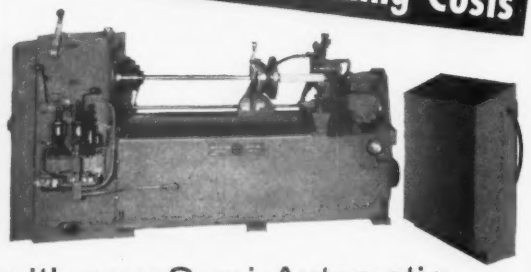

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Makes cuts from full rolls of vinyl, plastic, cloth, cellophane and similar tapes. Easily handles materials to maximums of 37" web, 2½" wall thickness and paper core I.D. 3½".

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New Goods

Trim-Quick Ceiling Tile

► Hallmark Plastic Corp., 151 Division St., South Hackensack, N. J., has introduced "Trim-Quick", a new ceiling tile designed for application with adhesive

or staples. Made of Firestone Velon, the tile is said to be washable, waterproof, fire-resistant and to have acoustical qualities. Produced in a variety of three-dimensional designs, each panel has six tiles. Trim-Quick comes in white and colors.

Miniature Dog Boots

► Miniature dog boots, molded from Geon vinyl resins by Hansen Handicrafts, Monrovia, Calif., are the latest items to keep canine pets not only comfortable but fashionable during inclement weather. Said to protect dog's paws from the discomforts of ice, snow, rocks, mud, burrs, and thorns, the smart looking boots slip on easily, and perfect fit is insured with an adjustable ankle strap buckle fastener. Marketed by Anne Ardmore's Hollywood Dog Togs, Sherman Oaks, Calif., the boots are slush molded from a combination of two Geon resins. So that all breeds of dogs may be fitted, the boots are produced in four different sizes and are available in red and black colors.

Airlex Plastic Insole

► A breathable plastic shoe insoling material which is soft and flexible has been introduced by Latex Fiber Industries, Inc., Beaver Falls, N. Y. Called "Airlex", the cellular plastic material is bonded to a neoprene-impregnated cellulose fiber sheet. The sheet is absorbent, and constructed so it can be adhered to stuck-on ribs in Goodyear welts, or to cement or staple lasted uppers in other types of shoe construction. Suitable for men's or women's shoes, Airlex is said to provide a cool, resilient surface for the foot. In addition to being long-wearing and crack-proof, the insoling material will not curl even after repeated wettings, the company claims.

Lee Rubber Toss Game

► A new toss game named "Fling" has been introduced by the Lee Rubber & Tire Corp., Conshohocken, Penna. Twelve games are included which are suitable for team or individual competition between playing groups of from two to eight persons. Suitable for adults, the game also includes such children's games as Tic-Tac-Toe, Scatterjaz, War, Chuckers, Target and 'Rithmatic. The

games are said to help children become adept in their hand to eye coordination and to teach them to appreciate the importance of accuracy and exactness in thinking as well as in movement. The squares, numerals and symbols are printed in yellow and black on a green mat 30 x 30 inches square. Sixteen rubber Fling discs are provided in blue, pink, yellow and green, which have been designed for perfect balance while in flight and land with a flat hit. The discs and mat are washable. The game, which can be compactly stored in a drawer or closet, is neatly packaged in a yellow, blue and red display box.

Wyatt Football Cleats

► Steel tipped football cleats that are lightweight and said to furnish exceptional holding power, have been introduced by Wyatt's Plastics of Houston, Texas. The new cleats are molded from a compound based on Pliolflex synthetic rubber and Pliolite S-6B rubber reinforcing resin. Stock for cleat production is broken down on processing equipment and then calendered. Cleats subsequently are formed by compression molding in multicavity molds and fitted with a threaded steel core, the top of which forms the cleat tip. The company states that this one-piece construction makes tip breakage virtually impossible and is an important safety feature when cleats are in actual use. The company reports that the new cleats were given rigid specification tests under extreme weather and field conditions and met all requirements. Wyatt's Plastics also markets a full line of regular hex game, round game, mud and practice cleats used by manufacturers of new shoes and by athletic reconditioners for remodeled equipment and replacements.

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Vulcanized
VEGETABLE OILS

rubber substitutes

Types, grades and blends
for every purpose, wherever
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can be used in production
of Rubber Goods—
be they Synthetic, Natural,
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A long established and proven product.

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Wide View Diving Mask

► Swimaster, 905 E. 59th St., Los Angeles 1, Calif., has announced the new "Wide View Diving Mask" designed for extreme peripheral vision through a tempered close-to-the-eyes wide view lens. Engineered to the most exacting requirements of the expert diver, the close-in design provides greater vision in all directions and reduces displacement and buoyancy to a minimum,

the company claims. The mask, constructed of black neoprene with a sealing edge of unicellular foam neoprene, provides a cushion seal of comfort even under pressure encountered at great diving depths. This material is said to have the facility of shaping to the individual facial contours after limited usage for a custom fit. The one-way exhaust valve at the end of the nosepiece is said to clear the mask of all accidental seepage by moderate nasal exhalation. This feature also makes the Wide View ideal for surface swimmers since exhalation through the nose is now possible.

Condor LS Belt

► Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J., has developed a new V-belt construction for use in oil rig pump and other long center industrial drives. The "Condor LS Belt" (Length Stabilized) features precision proportioned construction which is reported to eliminate V-Belt whip as well as similar causes of belt turnover and eventual failure. A completely redesigned compression area and repositioned strength members give the new belt lateral and longitudinal stability. Preformed before vulcanization to preserve the precisioned balance of the component parts of its internal structure, the belt is made with high-tensile, super strength synthetic fabrics. The Condor LS Belts are scientifically de-stretched during manufacture, factory measured under controlled humidity, length certified and packed under vacuum in special heat sealed, aluminum-lined, moisture-proof bags. The vacuum package stabilized belt length keeps it "factory-fresh".

Rolling Gas Tank

► An unusual rolling fluid transporter, whose 10 huge rubber tire bags towed by a pillow-tire FWD Teracruzer can move 5,000 gallons of fuel or other liquids over terrain inaccessible to conventional tank trucks, has been developed by the Four Wheel Drive Auto Co., Clintonville, Wisc. The new FWD fluid transporter, utilizing containers developed by Goodyear Tire & Rubber Co., has been unveiled for officials of the Defense Department and industry. The transporter, developed for the U. S. Army Transportation Research and Engineering Command by FWD, has 10 fluid carriers, each 5 feet high, 3½ feet wide, and 500 gallon capacity, mounted in pairs on FWD-developed axle and towing assemblies equipped with filling and emptying and braking systems.

The five pairs of containers in the Transportation Corps fuel train are fastened together by means of tow bars, lunettes, and pintle hooks. The fluid transporter can be towed by any type of vehicle which can traverse the terrain involved. By making the fluid containers their own mobile carriers, instead of transporting the load on flatbeds, the FWD fluid transporter can move liquids over sand, mud, side slopes, and rough ground as well as ice and deep snow. The rubber containers can be towed after removal of their liquid cargo merely by tapping them with the atmospheric air pressure or by inflating the newly developed "tire" with low pressure air or gas.

NoScrub Vinyl Flooring

► "NoScrub," a new line of terrazzo-style vinyl flooring, has been unveiled by the Goodyear Tire & Rubber Co., Akron, Ohio. Revealing a novel production technique, Goodyear describes the process as an intricate lamination of a heavy-duty vinyl, reverse printed, to a quality vinyl backing. Using this manufacturing process, it is possible to produce a quality flooring with premium styling at an economical price without sacrificing long-wear and self-maintenance characteristics associated with deluxe vinyl lines, the company claims. NoScrub, produced in nine by nine tile form and residential gauge only, is available in 12 popular decorator colors, company officials state.

Industrial Fire Hose

► Development of a new fire hose, designed primarily for use by the petroleum and chemical industries, has been announced by Goodyear Tire & Rubber Co., Akron, Ohio. Lightweight and flexible, the new hose has a guaranteed test pressure of 400 pounds. It is constructed of Neoprene cover and tube with Dacron filler and cotton warp. Developed with the special needs of the petroleum and chemical industries in mind, the hose is also recommended for use in mines, mills and factories where contaminated water is likely to be encountered during a fire.

Actual part processed by Monarch Rubber Co. with Sealtex. Shows rubber breaks . . . bond holds solid!

AT LOWER COST
...with SEALTEX
PHOSPHATE COATINGS

Achieve superior bonding with Sealtex phosphate coatings plus TEXO'S proven methods. Users consistently report "stock separation before bond failure" with this low-cost method. Applied by spray or immersion with conventional equipment. Sealtex characteristics are:

1) Simple chemical process
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Ideal for processing

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WHENEVER side register control is important, the Stanford WEB GUIDE can save its cost *many times over* by eliminating spoilage . . . maintaining accuracy . . . permitting full-speed operation. Operated by a super-sensitive diaphragm motor, it *instantly* corrects any change in web path by actually shifting roll at in-feed—holds side register *within plus or minus .010 inch!*

- Available with or without constant tension
- Eliminates telescoped and out-of-register rolls
- Handles any width — up to 10,000-lb. rolls
- Permits speeds up to 2,000 ft. per minute
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New Equipment

Giant Banbury Mixer and Pelletizing Unit

► Farrel-Birmingham Co., Inc., Ansonia, Conn., now manufactures a size 27 Banbury mixer (Figure 1) which has the greatest production potential of any ever built.

FIG. 1—Size 27 Banbury mixer.

Largest in the company's line of standard sizes, this mixer is a high-speed, high-pressure unit, roller bearing throughout, with a 2250 hp Uni-drive, the highest drive power ever applied to a Banbury mixer. Designed for short-cycle processing of tire stocks, this machine is capable of mixing more than a thousand pounds of 1.50 specific gravity stock in a single batch. To handle take-away of the high production possible with short mixing periods, Farrel-Birmingham has furnished a giant pelletizing unit (Figure 2) which has a 24-inch diameter screw in the hopper section reduced to 20 inches in the forward section. This pelletizer is the first in this large size to be equipped with a quick-opening, end-discharge head, a feature which affords a number of advantages, including faster and easier cleaning when changing from one stock to another.

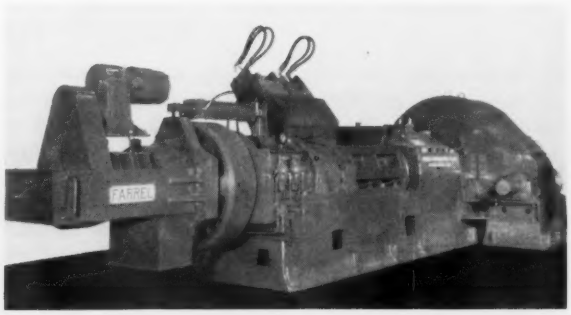
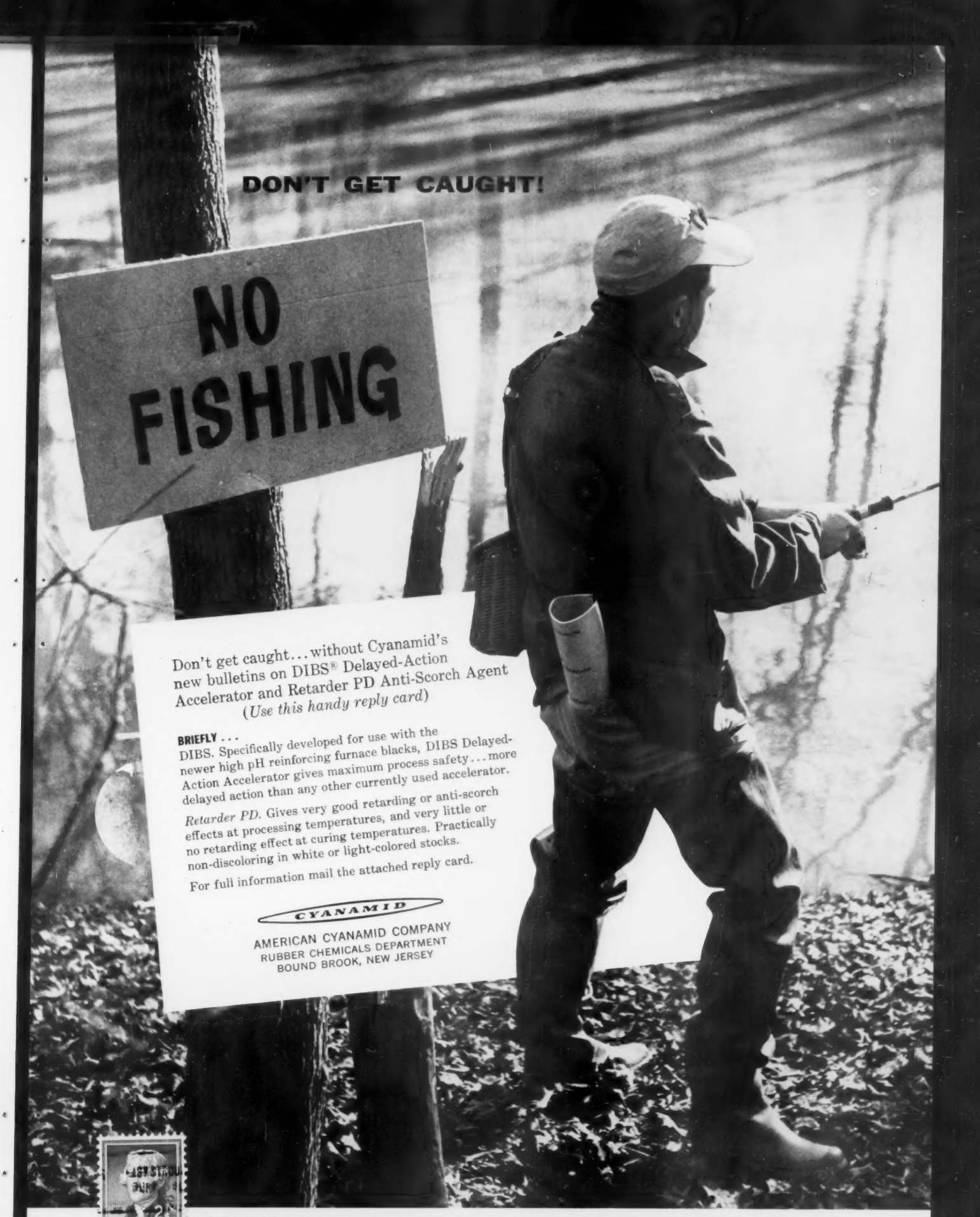


FIG. 2—Farrel-Birmingham pelletizing unit.



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(Use this handy reply card)

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DIBS. Specifically developed for use with the newer high pH reinforcing furnace blacks, DIBS Delayed-Action Accelerator gives maximum process safety... more delayed action than any other currently used accelerator.

Retarder PD. Gives very good retarding or anti-scorch effects at processing temperatures, and very little or no retarding effect at curing temperatures. Practically non-discoloring in white or light-colored stocks.

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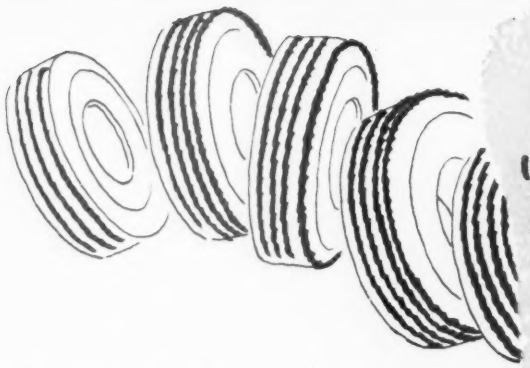
In Canada: St. Lawrence Chemical Company, Ltd. Montreal and Toronto



"when I said,
'no ozone cracking ever'
that clinched
the sale!"

UOP 88 and 288

antiozonants help salesmen make sales

When your salesmen go out to sell to your dealers . . . when your dealers' salesmen sell to consumers . . . UOP 88 and 288 antiozonants give your tires these plus factors that help them rack up more sales:

- Positive, built-in protection against ozone cracking, weather checking. Not just coated protective, UOP 88 and 288 form an impregnable *chemical barrier* against ozone attack . . .
- Pre-mold addition of UOP antiozonants 88 and 288 improve the rubber in the tire . . .
- Tire life is extended. No matter what the time lag between manufacture and consumer use of your product, it will be in prime condition, will give longer, better consumer satisfaction . . .
- No special handling of tires is needed. UOP 88 and 288 antiozonants are a part of the tire . . . won't chip off, crack, or peel—ever. The protection outlasts the tread.

The reputation of your company rides on every tire you make. UOP 88 and 288 help you protect that reputation, give your salesmen "an edge" when it comes to writing the order.

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RUBBER ANTIOZONANTS

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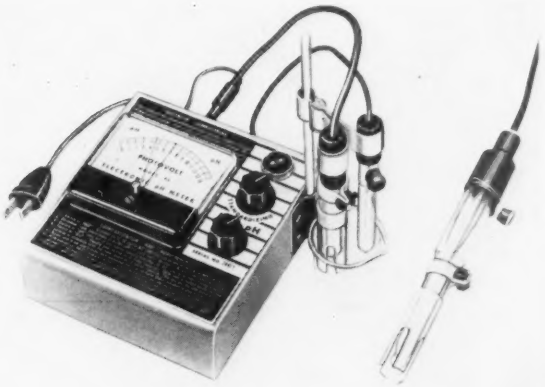
Photovolt Line-Operated pH Meter

► A fully stabilized line-operated pH meter is offered by Photovolt Corp., 95 Madison Ave., New York 16, N. Y., with either standard or combination glass-and-calomel electrodes. Called the Model 85, the meter has



a scale, which though only 3 inches long, covers the complete pH range of from 0 to 14. Scale divisions are of 0.2 pH units, which permits reproducible readings to 0.1 pH unit. The meter, suitable for acidimetric, oxidation reduction and dead-stop titrations, is unaffected by line voltage fluctuations and frequency variations, and suited for continuous service. A combined temperature and calibration control permit temperature compensation. The instrument is available with carrying case and usable with all Photovolt pH accessories.

Load Star Electronic Feed Control

► The Load Star electronic feed control unit is said to maintain within 5 per cent a constant and unwavering 100 per cent flow of feed into pulverizers, hammermills, extractors, mixers, attrition and roller mills, and other processing machinery. Effective liquid feed control can also be achieved. Advantages claimed for the unit are: savings in manpower; increased capacity, elimination of jamming, underloading, arching and clogging.

Industrial Water Coolers

► Baltimore Aircoil Co., Inc., P. O. Box 7322, Baltimore 27, Md., has announced a new line of industrial water coolers for closed system applications where process water temperatures are critical. By using these units it is said to be possible to save up to 95 per cent of the water used for industrial cooling. Three styles are available: centrifugal fan draw-through, centrifugal fan blow-through and propeller fan blow-through. Applications include cooling water for diesel or gas engines, air compressors, plastic molds and other types of water jacketed equipment.

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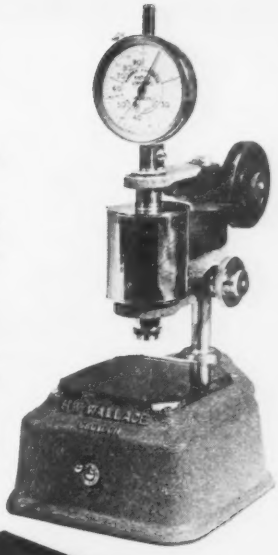

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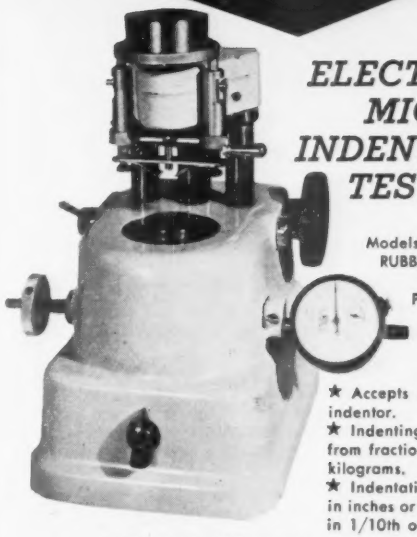

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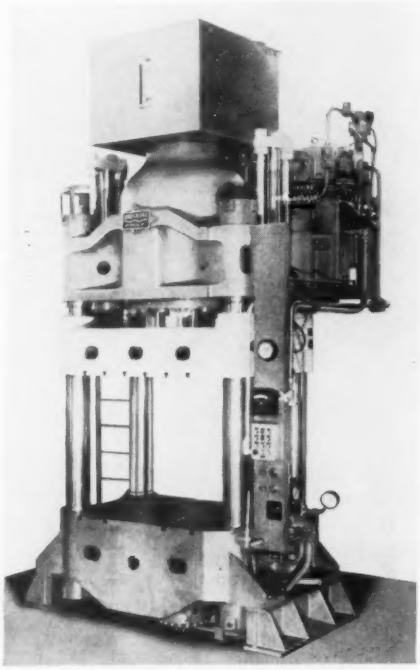
Birdsboro Plastics Molding Press

► Birdsboro Steel Foundry & Machine Co., Birdsboro, Penna., has designed and built a self-contained oil hydraulic molding press capable of curing cycle lengths up to 45 minutes. The 1,650-ton four-column vertical



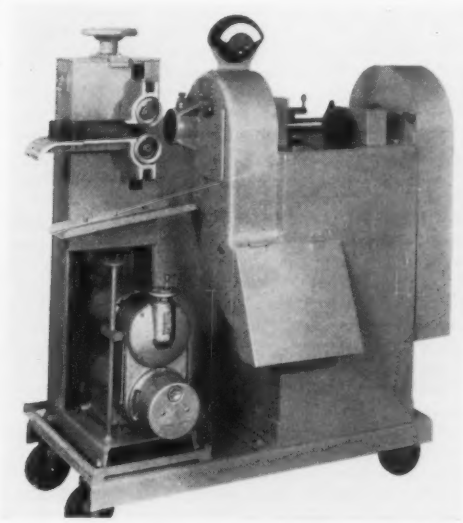
press, which has a 34-inch stroke, can mold a wide range of raw materials including rubber, plastic and allied products. The platen area is 62 inches left to right, 62 inches front to back and has a daylight dimension of 4-2/3 feet. Over-all height is 19 feet above the floor. Variable control of pressing speed is said to assure uniform density of the finished product. Pressing and curing cycles are completely automatic or can be push button controlled as required. A double pump design is said to save horsepower and lower the amount of heat induced into the oil hydraulic system.

Industrial Nucleonics Density Measurement System

► An AccuRay Density System which measures and/or controls fluid density, specific gravity, per cent solids or related quantity has been announced by Industrial Nucleonics Corp., Columbus, Ohio. The new density control unit is applicable for use with liquids, slurries, and flaked, granulated, powdered or other divided solids. Based on the principles of gamma ray transmission from a radioisotope, the system makes no physical contact with the flowing material. Measurements are also independent of flow rate and pressure. Depending upon the process and material measured, long term accuracies of ±.001 to ±.003 specific gravity are said to be readily obtainable.

Goodman Rubber Slug Cutter

► An improved model rubber slug cutter has been introduced by G. F. Goodman & Son, 401 Richmond St., Philadelphia 25, Penna. By using the principle of a rotary blade, this machine is said to provide continuous



production from extruder to tote box, without waste of time in coiling, stacking and cooling before cutting. As the cutting operation is timed to extruder delivery, a size change-over on the cutting equipment consumes only the time necessary to change an extruder die. To facilitate calculations in slug length, the cutter is equipped with a dial graduated in inches per minute on the power feed. A tachometer gives a direct reading of cuts per minute with either single or double blades. A reference chart shows the necessary dial settings for any length slug within the range of the machine.

► A new Norelco **electron microscope,** designated EM-75-B, for analytical work is produced by Philips Electronics, Inc., 750 South Fulton Ave., Mount Vernon, N. Y. Magnification is continuously variable, and ranges from 1200 to 12,000 diameters on the screen. Resolving power is better than 50 Angstroms.

► A new line of cushion-tired **lift trucks** in the 6000, 7000 and 8000 pound load range has been released by Hyster Co., Portland, Ore. Called the Space Saver series, the new models are said to reflect advance concepts in lift truck design with major emphasis on job engineered components.

► A new model **Van de Graaff particle accelerator,** a product of High Voltage Engineering Corp., Burlington, Mass., is said to enable in-line radiation processing in certain industrial applications where it had been economically impractical. Called Model GS, the 1.5 million-volt machine is designed to produce ionizing radiation for under $20,000 per kw.

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Reviews

BOOKS

Zinc Oxide Rediscovered. Prepared by Harvey E. Brown. Published by New Jersey Zinc Co., 160 Front St., New York 38, N. Y. 8½ x 11¼ in. 100 pp. $3.00.

This attractive book is perhaps the most comprehensive presentation of zinc oxide ever made, and those desiring overall information on the subject in a semi-technical manner will find much of value in it. A survey of the material is made by dividing the book into three sections: Established Properties of Zinc Oxide, Frontier Properties of Zinc Oxide and Illustrative Applications.

In the first section thermal properties are among the subjects discussed, and several pages are devoted to the effects of zinc oxide in rubber in this respect. Some of the other topics are components and constitution, history of manufacture and crystal structure.

In the part on frontier properties, devoted to those whose potential is of great current interest, the following properties, among many others are analyzed in detail: semiconductor, solid-state reaction, ferrite, catalytic and chemical. This section, which comprises the major portion of the book, is of value for its specific information and suggestions for present and future uses.

In the section on applications, rubber is among those discussed with special attention given to passenger car tires, wire and cable insulation, rubber rolls for calenders and silicone rubber. The extensive appendix is unusually useful as it breaks down the list of references by subject: components and constitution, history, thermal properties, chemical properties and others.

•

Der Schlagversuch in der Werkstoffprüfung. (The Impact Test in Material Testing). By Dr. Wilhelm Späth. Published by A. W. Gentner Verlag, Stuttgart, Germany. 6 x 8½ in. 180 pp. 21.50 DM (About $5.25). (In German).

This book discusses the question of toughness and brittle breaks and methods of testing for these in connection with elastomers, plastics and a great variety of other materials. The book is divided into three sections: (1) specifications, test equipment, measured results and theories (2) a new impact tester which makes numerous kinds of measurements (3) conclusions on the part that impact tests play in the testing of materials. An ample use of photographs and illustrations adds to the value of the book.

•

Six Decades of The Chemists' Club. By D. H. Killeffer. Published by The Chemists' Club, 52 East 41st St., New York 17, N. Y. 6½ x 10 in. 66 pp.

This history, which comes just ten years after the fiftieth anniversary history of the Chemist's Club, published in 1948, has been prompted by the growth of the organization in the last decade. The founding of the Club back in 1898 begins the account, the narrative continuing with the story of the first permanent home, incorporation, birth and development of the library, and other landmarks of interest. Together they make a readable informal telling of the life and times of an organization important to the chemical industry and its personnel.

•

The Story of Expanded Rubber. By A. Cooper. Published by Expanded Rubber Co., Ltd., Croydon, England. 5½ x 8¾ in. 76 pp.

This book has been issued by Expanded Rubber Co. on the occasion of its twenty-first anniversary. Divided into three sections, it tells the story of the company, its founding and history; the material, expanded rubber, its discovery and development; and the position of the company today. The quality of the numerous photographs and their reproduction is excellent.

Conductive Rubber: Its Production, Application and Test Methods. By R. H. Norman. Published by Maclaren and Sons, Ltd., Maclaren House, 131 Great Suffolk St., London S. E. 1, England. 7½ x 10 in. 99 pp. $3.00

(Available From Book Department, RUBBER AGE)

This book is the first of four technical manuals produced by staff members of the Research Association of British Rubber Manufacturers. These manuals deal with subjects on which RABRM has made intensive investigations. This publication deals with the conductive and antistatic classes of rubber, discussing such matters as contact resistance, including the effects of resistivity of rubber, type of contact, voltage, mechanical pressure, etc. Under manufacture, the author discusses the concentration and types of carbon black, milling and mixing, compounding ingredients, vulcanizing conditions and polymer types. The effects of stress, time and other variables on resistivity are also covered as are test methods and the uses of conductive rubber. A complete index is provided. The reader will find a great deal of stimulating information on the subject of conductive rubber as well as a good many possibilities for future investigation.

•

Rubber Developments in Latin America. By D. M. Phelps. Published by the Bureau of Business Research, School of Business Administration, University of Michigan, Ann Arbor, Mich. 6 x 9¼ in. 174 pp. $5.00.

This interesting study was first undertaken as an assignment from the Department of Social and Economic Affairs of the Organization of American States. Subsequently, the author carried on the project as an individual research project, and this book is the result. In discussing this matter of natural rubber production in the Americas, the author first gives some consideration to the over-all world supply and demand situation and then relates his discussion to the Latin American countries. Competition in natural rubber production and the competition between natural and synthetic rubber are analyzed. Also covered is the matter of expansion of natural rubber production for security purposes and the problems involved in rubber expansion programs. Tables and charts offering some pertinent statistics on the subject are included. Certainly, all who have an interest in the rubber industry will find much of value in this book.

•

Rubber Trade Directory of Great Britain: 1957-58. Published by Maclaren and Sons, Ltd., Maclaren House, 131 Great Suffolk St., S. E. 1, London, England. 6 x 9½ in. 749 pp. $12.50 (U. S. and Canada).

(Available From Book Department, RUBBER AGE)

This, the third edition of the "Rubber Trade Directory of Great Britain," has been completely revised and brought up-to-date. Following the pattern established in the earlier two editions, the directory provides ready reference to rubber manufacturers and their products; suppliers of machinery and equipment; suppliers of chemicals and compounding ingredients; suppliers of fabrics and textiles; suppliers of natural, synthetic scrap and reclaimed rubber, and a wealth of other information having to do with trade and research organizations, brand names, rubber technology courses, and a "who's who" of the industry. The table of contents and the subject index appear in English, French, German and Spanish, thus facilitating the directory's use for Continental readers. A handsome publication, this directory provides much useful information on the rubber industry in Great Britain.

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BOOKLETS, CATALOGS, etc.

Problems and Practices in Engineering Management. (Special Report No. 24). American Management Association, 1515 Broadway, New York 36, N. Y. 6 x 9 in. 132 pp. $2.50 (members); $3.75 (non-members).

This report is designed to bring management up to date on how best to use its engineering manpower, both in technical capacities and as managers. Consisting of 12 papers by leaders in the industrial and academic worlds, the book is divided into four main sections on the following subjects: The Challenge to Management, The Engineering Organization: Its Structure and Functions, Administering the Engineering Program, and Systems Engineering. Much useful information of direct interest to any organization which employs engineers is included. Interesting reading, especially in view of the current shortage of technical personnel.

•

Evaluation of Non-Black Fillers for Colored Butyl Compounding. (Bulletin No. 104-I). Thiokol Chemical Corp., 780 North Clinton Ave., Trenton, N. J. 8½ x 11 in. 16 pp.

This bulletin presents the results of a study made to determine fillers, or blends of fillers, to provide smoothly colored butyl rubber extrusion compounds, and to develop effective compounds of butyl rubber using these fillers. The fillers are divided into four groups: very fine particle size fillers, calcium carbonates, clays, and miscellaneous fillers. A complete report on the testing procedures and extensive data on the properties of the various stocks compounded with the approximately 40 fillers tested are given. Valuable information for those dealing with colored butyl rubber products.

•

Advanced I-T-E Low Voltage Switchgear. (Bulletin No. 6004-C.). Switchgear Division, I-T-E Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia 30, Penna. 8½ x 11 in. 20 pp.

This bulletin gives a review of I-T-E low voltage power circuit breakers and switchboards, which range in unit ratings from 225 to 4000 amperes. Advanced features of K-line breakers are also described and illustrated. Application tables give complete breaker ratings, control-power requirements and ranges of overcurrent trip devices. A review of the three principal system types—fully rated, cascade and selective—aids in selection of proper breakers for low voltage drawout switchgear applications.

•

Chlorowax 70 in Neoprene Compounds. Chlorinated Products Division, Diamond Alkali Co., 300 Union Commerce Building, Cleveland 14, Ohio. 8½ x 11 in. 3 pp.

The use of Chlorowax 70 as a plasticizing and reinforcing resin in neoprene compounds is covered in this short bulletin. Advantages claimed for the resinous chlorinated paraffin are itemized and explained, and applications in flame retardant neoprene compounds for cable jackets, conveyor belting and matting and flooring are described. A table provides data on the physical properties achieved by different parts of Chlorowax 70 at different cure times.

•

Picco Resins. Pennsylvania Industrial Chemical Corp., Clairton, Penna. 8½ x 11 in. 12 pp.

This brochure offers property data on Picco coumarone-indene resins, modified styrene resins and plasticizers. These resins, available in hard, soft, medium, rubber and modified styrene grades, are described by charts which show physical and chemical data, melt viscosities, compatibilities and solubilities. An application table gives information on uses of the various resins in a large number of end products.

Machinery for Processing Rubber, Plastics, and Other Materials. (Catalog 58-L). Stewart Bolling & Co., Inc., 3190 East 65th St., Cleveland 27, Ohio. 8½ x 11 in. 24 pp.

This publication is devoted to the line of equipment developed and produced by Stewart-Bolling. Each machine is illustrated with a clear photograph, and descriptive text lists data on size, power source, component parts and other relevant information. The index lists sections on the following: experimental mills, small size production mills, refiners, calenders, presses, hydraulic units, vulcanizers, intensive mixers and production equipment. The presentation is unusually clear and comprehensive.

•

Synpol 1708: New Improved, Light-Colored, Cold, Oil-Extended Polymer. (Bulletin No. 1). Texas-U. S. Chemical Co., 260 Madison Ave., New York 16, N. Y. 8½ x 11 in. 10 pp.

The first of a series of technical bulletins from the company, this publication contains extensive data on a new polymer which may be interchanged with the previously used GRS-1708. A physical and chemical description is given, and stock recipes suggested for such uses as sole compounds, Type R code insulation, cord insulation and jacket compounds, wringer rolls, floor tile, and basin stoppers. Physical properties of the stocks are detailed.

•

Falk All-Steel Shaft Mounted Drives. (Bulletin No. 7100). Falk Corp., Milwaukee 1, Wisc. 8½ x 11 in. 32 pp.

The purpose of this bulletin is to make available for ready reference the facts and figures on the complete line of Falk shaft mounted drives. Subjects discussed are design and construction, use under specific conditions, selection, vertical application, variable speed application, accessories, dimensions, bushings, sheave and belt selections, motor information and typical installations. An extensive use of schematic diagrams and tables is made in presentation of the information.

•

Versatrol All-Purpose Electrical Control. (Bulletin No. 106). Assembly Products, Inc., 75 Wilson Mills Road, Chesterland, Ohio. 8½ x 11 in. 12 pp.

This publication explains applications of the most common of the Versatrol electrical circuits, both automatic and limit, including a new "load sentry" overload control. Detailed are such functions as control of variables, control of ac or dc current, control of voltage limit, manual reset or lockout control, steady on-off control with automatic reset, and others. Complete ordering information is provided.

•

Neoprene Toy Balloons. By T. E. Betchel. (Report BL-334). Elastomer Chemicals Department, E. I. duPont de Nemours & Co., Inc., Wilmington 98, Del. 6¼ x 9½ in. 6 pp.

The use of Neoprene Latex Type 750 in toy balloons is the subject of this bulletin. Compounding is treated in some detail, with the formulas for two specific compounds given and physical properties of the stocks itemized. A section on processing with information on drying times and temperatures closes the booklet. Advantages for application in balloons, including good air and gas retention of the film, are enumerated.

•

Graham Variable Speed Drives. (Bulletin No. 550). Graham Transmissions, Inc., Menomonee Falls, Wisc. 8¼ x 11 in. 12 pp.

Data on the line of variable speed drives produced by the company are given in this bulletin. Operating principles and design advantages are explained, and new systems for automatic control of speed are described. Tables for selection of the right drive for particular applications with supplementary schematic diagrams are included.

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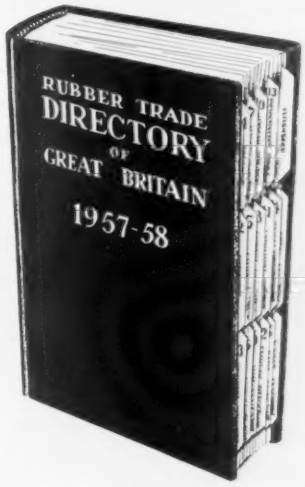

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Natural Rubber

Since our last report (January 2), the price of spot rubber on the New York Commodity Exchange has moved in a range of 250 points, high for the period being 28.63c reached on January 2, and low being 26.13c reached on January 29. The average price of spot rubber for the month of January was 27.15c based on 22 trading days. This compares with an average of 29.25c in the previous month.

Analysts at Merrill Lynch, Pierce Fenner & Beane point out that prices have been in a steep downtrend. Though bearish factors are powerful and persistent, their impact on prices may be resisted primarily because of the increased price competition between natural and synthetic; the tightening squeeze on planters' profits, and the situation in Indonesia.

During the last week in January, futures prices struck close to the lowest ground in nearly 3½ years. At their new depths, they were also practically in line with the bottoms of May 31, 1956, from which point prices staged a sharp rally of 12c.

Competition Increasing

At the new low levels, synthetic rubber is now more expensive to land in Europe, not to mention the dollar currency shortage. It is reported that natural prices are fast approaching costs of production. Moreover, more rubber is now in smallholders' hands than in 1954.

MLPFB analysts believe that an upward price reaction would not be surprising in view of past experience. A great deal of long liquidation has taken place. Total open interest in New York futures has declined to new lows. In December, the total was still over 1,000 lots. At this writing, it has succumbed below 800.

World buying has been lethargic with no real encouragement from the Communist bloc countries. In December, United States natural rubber stocks increased to 103,200 tons from 98,700 in November. Automobile, tire, and used car inventories are high. Automobile production is slow and no pickup in sales is seen until the second quarter.

The constant downtrend in the use of natural rubber is likely to become even more marked, especially in Europe. The specter of synthetic rubber productive capacity looms larger than ever not only in the U.S. but in Europe as well.

Indonesian Situation

Let us assume that the world's natural rubber production does falter over the longer term. Those friendly to an eventual higher price point out that Indonesian production largely from a loss in technicians, might decline appreciably perhaps by as much as 100,000 tons in 1959. This amount might be replaced by synthetic in Europe, where manufacturers are becoming more receptive.

Some now profess to see rubber at a 20c level, as it was in 1952-53. At any rate, the current rubber outlook, as it relates to natural output, is uncertain enough to suggest caution on both sides of the market.

NEW YORK, FEBRUARY 3, 1958

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM JANUARY 1 TO JANUARY 31

Jan.	Spot	Mar.	May	July	Sept.	Sales
1	....	....	....	....	....	....
2	28.63	28.70	28.70	28.70	28.67	73
3	28.13	28.20	28.35	28.40	28.40	82
4	....	....	....	....	....	....
4	....	....	....	....	....	....
6	28.50	28.63	28.65	28.65	28.60	20
7	28.38	28.45	28.45	28.45	28.45	17
8	27.75	27.70	27.75	27.80	27.80	80
9	27.63	27.45	27.60	27.65	27.60	55
10	27.25	27.32	27.50	27.55	27.60	73
11	....	....	....	....	....	....
12	....	....	....	....	....	....
13	27.63	27.60	27.85	27.85	27.90	14
14	27.63	27.55	27.85	27.85	27.85	14
15	26.75	26.95	27.45	27.50	27.45	35
16	26.88	27.15	27.50	27.55	27.60	20
17	27.13	27.30	27.58	27.65	27.65	40
18	....	....	....	....	....	....
19	....	....	....	....	....	....
20	27.38	27.50	27.80	27.80	27.85	28
21	26.75	26.80	27.13	27.20	27.25	50
22	26.75	26.65	27.00	27.25	27.25	37
23	26.50	26.50	26.90	26.95	27.05	32
24	26.63	26.65	27.05	27.05	27.20	41
25	....	....	....	....	....	....
26	....	....	....	....	....	....
27	25.88	25.95	26.35	26.45	26.50	67
28	25.75	25.75	26.20	26.35	26.50	90
29	26.13	26.10	26.55	26.70	26.75	89
30	26.63	26.75	26.90	27.10	27.20	69
31	26.63	26.75	27.10	27.20	27.30	65

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.26⅝
Mar.	.26¾
Apr.	.26⅞
Thin Latex Crepe:	
Spot	.29
Thin Brown Crepe, No. 2	.24½
Flat Bark Crepe	.20¾

London Market
(Standard Smoked Sheets)

Mar.	27.14 - 27.29
Apr.-June	27.44 - 27.58

Singapore Market
(Standard Smoked Sheets)

Mar.	25.01 - 25.09

Middling Upland Quotations

	Jan. 2	February 3		
	Close	High	Low	Close
Mar.	35.75	35.30	35.00	35.05
May	35.92	35.33	35.04	35.10
July	35.78	35.30	35.00	35.08

Notes & Quotes

Writing in the February, 1958, issue of *Natural Rubber News*, H. C. Bugbee, president of the Natural Rubber Bureau, stated that it is especially difficult to forecast how strongly the American economy will rebound from the present slowing down process or how quickly. The rubber manufacturing industry, he declared, is optimistic, and the Rubber Manufacturers Association has publicly forecast United States rubber consumption for the year 1958 at 1,525,000 long tons or just about equal to the all-time 1955 consumption peak of 1,525,699 tons. There are no real grounds, he said, for expecting that a depression of a major or long-lasting nature is just around the corner.

Synthetic Rubber

According to the Rubber Manufacturers Association, consumption of new rubber in the United States during 1957 established the second highest year on record amounting to 1,467,506 long tons, compared with the all-time high of 1,529,699 long tons in 1955.

Consumption of synthetic rubber in 1957 amounted to 928,359 long tons, against the 874,394 long tons consumed in the previous year. Consumption of synthetic rubber in 1957 set an all-time record. Of the total new rubber consumed in 1957, 63.26 per cent was synthetic rubber. In the previous year, 60.87 per cent of total new rubber consumption was synthetic rubber.

RMA notes that production of synthetic rubber in 1957 established a yearly high of 1,118,308 long tons, contrasted with the 1,079,574 long tons produced in 1956.

Synthetic Statistics By Type

The RMA figures indicate that a total of 907,551 long tons of butadiene-styrene type rubber were produced in 1957 and 5,021 long tons imported. Exports during the year amounted to 156,789 long tons. A net total of 755,783 long tons of butadiene-styrene rubber were thus available in the American market. Consumption of this type of rubber in 1957 amounted to 772,574 long tons, while stocks as of December 31, 1957 totaled 139,631 tons.

RMA states that 110,721 long tons of neoprene were produced in the United States in 1957 and 29,614 long tons exported, leaving a net new supply of 81,107 long tons. Consumption of neoprene in 1957 amounted to 75,471 long tons. Stocks as of the end of the year totaled 18,906 long tons.

Butyl production last year amounted to 66,936 long tons while some 520 were imported and 8,877 long tons exported leaving a net new supply of 58,579 long tons. In 1957, 55,313 long tons of butyl rubber were consumed. Stocks as of December 31, 1957, stood at 31,427 long tons.

As for the N-types, a total of 33,100 long tons were produced last year and 517 long tons were imported. A total of 6,194 long tons were exported, leaving a net new supply of 27,423 long tons. Consumption of this type of rubber in 1957 is set as 25,001 long tons by RMA, and stocks at 7,748 long tons.

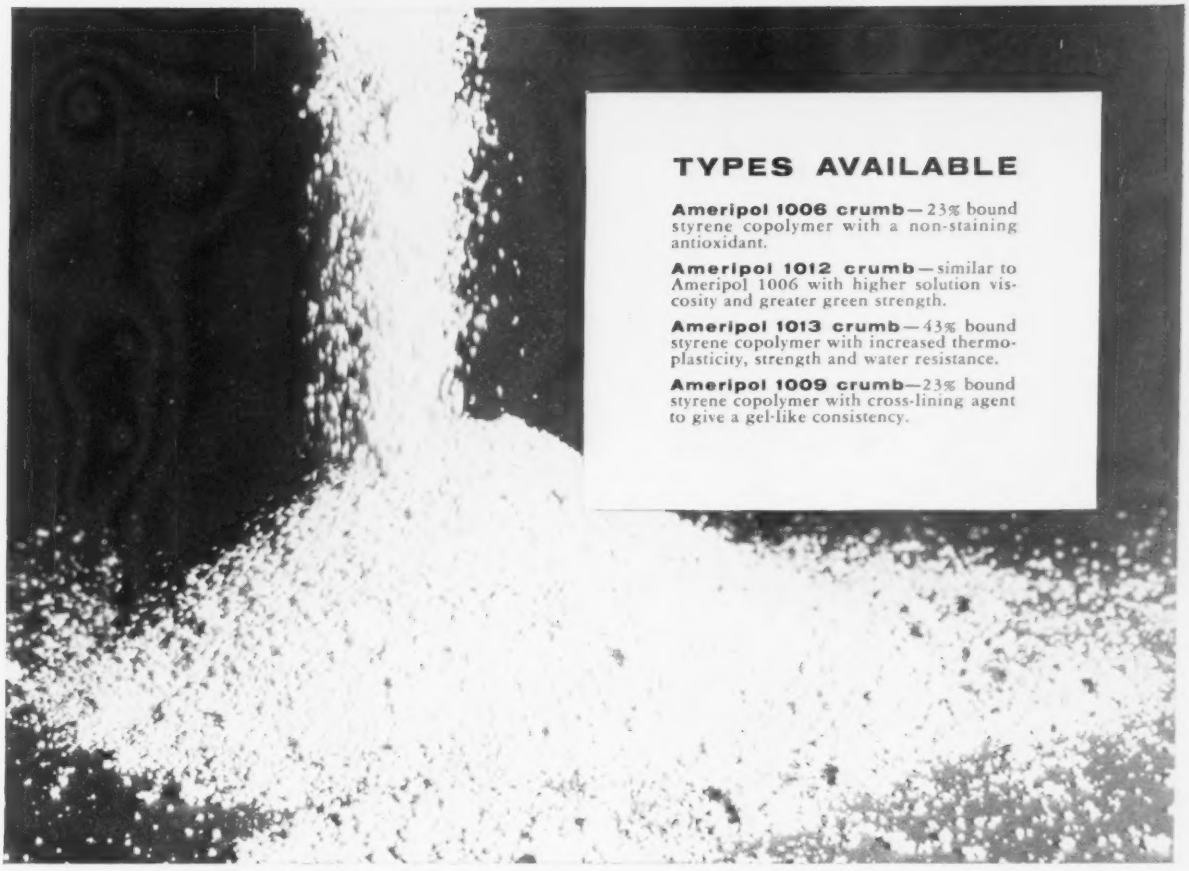
Increasing Consumption Seen

It will be seen from the foregoing figures that the consumption pattern for synthetic rubber as a whole as well as for each of the individual types is on the increase. Some 50,000 long tons more of butadiene-styrene type were consumed last year than in 1956. Neoprene consumption in 1957 was about 1,000 long tons more than in the preceding year.

N-type consumption in 1957 was also a little ahead of the preceding year. Even butyl rubber showed a gain over the preceding year—a gain of some 6,000 long tons. In all, it is apparent that the statistical pattern of synthetic rubber consumption is favorable. From the long range view, the pattern is very favorable, indeed.

Goodrich-Gulf Chemicals, Inc.

Ameripol RUBBER


TYPES AVAILABLE
Ameripol 1006 crumb—23% bound styrene copolymer with a non-staining antioxidant.
Ameripol 1012 crumb—similar to Ameripol 1006 with higher solution viscosity and greater green strength.
Ameripol 1013 crumb—43% bound styrene copolymer with increased thermoplasticity, strength and water resistance.
Ameripol 1009 crumb—23% bound styrene copolymer with cross-lining agent to give a gel-like consistency.

NEW FORM FOR AMERIPOL

Rubber crumbles...cost tumbles

Processing cost savings are considerable with Ameripol hot polymers in "crumb" form. You no longer need expensive milling and cutting or pelletizing equipment in solution processes. Ameripol "crumb" form rubber can be dissolved in a churn or a simple agitated vessel.

This innovation in SBR rubber was developed by Goodrich-Gulf research for manufacturers of rubber adhesives, mastics, cements or other products where rubber raw material must be put in solution before processing. It cuts costs in molding and extrusion, too. Manual cutting of conventional bales of rubber to exact weight can be eliminated.

Ameripol hot polymers in crumb form have been fully evaluated in use and are available in production quantities. More than ever, Ameripol is the preferred man-made rubber. Contact us for your requirements.

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THE NAME TO REMEMBER FOR QUALITY BACKED BY YEARS OF RESEARCH AND EXPERIENCE

PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER POLYMERS

(dry types—per pound carload unless otherwise specified)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N3 and N5	.5800 [2]
Chemigum N6 and N7	.5000 [2]
Herecol N-33	.6800 [2]
Hycar 1001	.5800 [2]
Hycar 1002	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042 and 1043	.5000 [2]
Hycar 1312	.5000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [2]
Polysar Krynac 801	.5800 [2]
Polysar Krynac 802	.5000 [2]
Polysar Krynac 803	.5000 [2]

Butadiene-Styrene Types

Ameripol 1000	.2410 [2]
Ameripol 1001	.2410 [2]
Ameripol 1002	.2435 [2]
Ameripol 1006	.2410 [2]
Ameripol 1007	.2425 [2]
Ameripol 1009	.2475 [2]
Ameripol 1500	.2410 [2]
Ameripol 1501	.2410 [2]
Ameripol 1502	.2410 [2]
Ameripol 1703	.2060 [2]
Ameripol 1705	.2035 [2]
Ameripol 1707	.1910 [2]
Ameripol 1708	.1910 [2]
Ameripol 1710	.1885 [2]
Ameripol 1712	.1885 [2]
ASRC 1000	.2410 [2]
ASRC 1001	.2410 [2]
ASRC 1004	.2410 [2]
ASRC 1006	.2410 [2]
ASRC 1009	.2475 [2]
ASRC 1018	.2700 [2]
ASRC 1019	.2650 [2]
ASRC 1500	.2410 [2]
ASRC 1502	.2410 [2]
ASRC 1503	.2625 [2]
ASRC 1703	.2060 [2]
ASRC 1708	.1910 [2]
ASCR 3110	.2600 [2]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Copo 1500	.2410 [2]
Copo 1502	.2410 [2]
Copo 1505	.2610 [2]
Copo 1712	.1885 [2]
FR-S 1000	.2410 [2]
FR-S 1001	.2410 [2]

Butadiene-Styrene (Cont'd)

FR-S 1004	.2410 [2]
FR-S 1006	.2410 [2]
FR-S 1009	.2475 [2]
FR-S 1010	.2600 [2]
FR-S 1012	.2425 [2]
FR-S 1013	.2500 [2]
FR-S 1014	.2810 [2]
FR-S 1015	.2910 [2]
FR-S 1500	.2410 [2]
FR-S 1502	.2410 [2]
FR-S 1703	.2060 [2]
FR-S 1705	.2035 [2]
FR-S 1712	.1885 [2]
Naugapol 1016	.2650 [2]
Naugapol 1018	.2700 [2]
Naugapol 1019	.2650 [2]
Naugapol 1021	.3000 [2]
Naugapol 1022	.2800 [2]
Naugapol 1023	.2850 [2]
Naugapol 1503	.2625 [2]
Naugapol 1504	.2950 [2]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1940 [1]
Philprene 1104	.1900 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1930 [1]
Philprene 1601	.1930 [1]
Philprene 1605	.1900 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1885 [1]
Philprene 1803	.1740 [1]
Plioflex 1006	.2410 [2]
Plioflex 1500	.2410 [2]
Plioflex 1502	.2410 [2]
Plioflex 1703	.2060 [2]
Plioflex 1710	.1885 [2]
Plioflex 1712	.1885 [2]
Plioflex 1773	.2060 [2]
Plioflex 1778	.1910 [2]
Polysar Kryflex 200	.2510 [2]
Polysar Krylene	.2410 [2]
Polysar Krylene NS	.2410 [2]
Polysar Krynol 651	.1885 [2]
Polysar Krynol 652	.1910 [2]
Polysar S	.2410 [2]
Polysar S-50	.2410 [2]
Polysar S-X 371	.2550 [2]
Polysar SS-250	.2875 [2]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1600	.1825 [2]
S-1601	.1825 [2]
S-1602	.1825 [2]

Butadiene-Styrene (Cont'd)

S-1703	.1950 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1801	.1675 [2]
S-1803	.1650 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]
Synpol 1712	.1885 [1]

Butyl Rubbers

Enjay Butyl 035 and 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Buty 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [2]
Polysar Butyl 101	.2175 [2]
Polysar Butyl 200 and 300	.2450 [2]
Polysar Butyl 301	.2550 [2]
Polysar Butyl 400	.2450 [2]

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.50 [2]
GE Silicone Gum (not compounded)	4.00 [2]
Silastic (compounded)	1.90 [2]
Silastic (gums)	3.85 [2]
Union Carbide (gums)	4.00 [2]
Union Carbide (compounds)	2.50 [2]

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.4700 [1]
Thiokol Type FA	.6400 [2]
Thiokol PR-1	.9500 [2]
Thiokol Type ST	1.00 [2]

(latices—all prices per pound dry weight)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [2]
Chemigum 235	.5400 [2]
Chemigum 236	.5400 [2]
Chemigum 245	.4600 [2]
Chemigum 246	.4600 [2]
Hycar 1512	.4600 [2]
Hycar 1551	.5400 [2]
Hycar 1552	.4600 [2]
Hycar 1561	.5400 [2]
Hycar 1562	.4600 [2]
Hycar 1571	.5400 [2]
Hycar 1572	.5100 [2]
Hycar 1577	.4600 [2]
Hycar 1852	.4600 [2]

Butadiene-Styrene Types

Copo 2101	.3000 [2]
Copo 2102	.3200 [2]

Butadiene-Styrene (Cont'd)

Copo 2105	.3200 [2]
Copo X-765	.3000 [2]
FR-S 2000	.2775 [2]
FR-S 2001	.2775 [2]
FR-S 2002	.3000 [2]
FR-S 2003	.3050 [2]
FR-S 2004	.3050 [2]
FR-S 2006	.2900 [2]
FR-S 2105	.3200 [2]
Pliolite 2000	.2775 [2]
Pliolite 2076	.2900 [2]
Pliolite 2101	.2775 [2]
Pliolite 2104	.3200 [2]
Pliolite 2105	.3200 [2]
Pliolite 2107	.3250 [2]
Pliolite 2108	.3050 [2]
Naugatex 2000	.2630 [2]
Naugatex 2001	.2630 [2]
Naugatex 2002	.2880 [2]
Naugatex 2006	.2630 [2]
Naugatex 2105	.3120 [2]
Naugatex X-765	.2900 [2]
Naugatex X-767	.3120 [2]

Butadiene-Styrene (Cont'd)

S-2000	.2275 [2]
S-2006	.2150 [2]
S-2101	.2250 [2]
S-2105	.3100 [2]
S-2107	.3200 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [2]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

MARKETS

(continued)

Reclaimed Rubber

Figures made available by the Rubber Manufacturers Association indicate that a total of 271,161 long tons of reclaimed rubber were produced in 1957 and 146 long tons were imported while 13,053 long tons were exported. Total net new supply of reclaimed rubber in 1957, therefore, amounted to 258,254 long tons.

RMA states that 268,088 long tons of reclaimed rubber were consumed last year, against the 270,547 long tons consumed in 1956. Stocks as of December 31, 1957, stood at 27,451 long tons against the 34,969 long tons which were on hand as of December 31, 1956.

The slowing down of automobile production in the past two months is having its effect on the reclaimed rubber market. An expected upturn in automobile production in the Spring will likely accelerate the market. It is expected that the next few months will see reclaim production at the 19,000 to 20,000 ton per month level with consumption proceeding at about the same pace.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

The coming of the new year has not brought about any great changes in the scrap rubber situation. It is reported by the Rubber Manufacturers Association that 242,842 long tons of scrap rubber were consumed in 1957. As of December 31, 1957, there were 70,958 long tons of scrap rubber in stocks.

The general slow down affecting the entire economy is likewise affecting the scrap rubber market. The trade reports that during the past few weeks, reclaimers have not been particularly anxious to acquire scrap rubber. Stocks of scrap on hand are equal to about 3 months' consumption.

Marketwise, there was little new business reported. Some activity was noted at Akron and about the only items which aroused any interest at Eastern points were butyl tubes. Prices remain at about the same levels with some factors inclined to regard quotations at Eastern points as nominal.

(Prices Delivered Akron)

Mixed tires	ton	15.50
Light colored carcass	lb.	.05
No. 1 peelings	ton	30.00
No. 2 peelings	ton	25.00
No. 3 peelings	ton	18.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.50
Natural Rubber Red Tubes	lb.	.08
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.04⅜

Tire Fabrics

According to the Textile Economics Bureau, shipments of high tenacity rayon yarn for tire cord and related industrial uses declined during 1957, with total domestic shipments off by 9 per cent, compared to 1956, and total domestic plus export shipments off 7 per cent. Shipments to tire manufacturers actually was off 11 per cent, or 36,200,000 pounds, but this was partially offset by an increase in shipments to hose and belting manufacturers of 11 per cent, or 1,600,000 pounds.

Shipments of high tenacity rayon yarn to domestic consumers for 1957 totaled 324,000,000 pounds, compared with 357,500,000 pounds in 1956 and 429,600,000 pounds in 1955. Domestic and export shipments totaled 337,800,000 pounds in 1957; 364,500,000 pounds in 1956, and 434,300,000 pounds in 1955.

While domestic shipments of tire yarn have declined in the last two years, exports have risen from 4,700,000 pounds in 1955 to 7,000,000 pounds in 1956 and 13,800,000 pounds in 1957.

United States production of high tenacity yarn totaled 340,800,000 pounds in 1957; 370,500,000 in 1956, and 432,700,000 pounds in 1955.

As of December 31, 1957, there were 16,200,000 pounds of high tenacity rayon yarn in stocks compared with 13,200,000 pounds in the previous year and 7,200,000 pounds in 1955. Both shipments and production of high tenacity rayon yarn, incidentally, moved upward in the fourth quarter of 1957, compared to the third quarter of 1956.

Non-Woven Fabric Market

Rapid growth and developments in non-woven fabrics indicate that their production and sales volume will increase 100 per cent in three years, according to Stephen I. Rudo, director of research and development of Warner Textile Consultants. A bright future looms for the non-woven fabrics which are likely to emerge as a new industry.

With its commercial history of only some ten years, output of non-woven fabrics has grown from practically zero to over 90,000,000 pounds in 1957, Mr. Rudo stated. Its yearly consumption value and its factory sales price level has already reached $100,000,000.

Mr. Rudo emphasized that non-woven fabrics can not be expected to displace other types of textiles to any notable extent in the foreseeable future.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.68
9.25 oz. (per square yard)	lb.	.66
11.65 oz. (per square yard)	lb.	.62
14.4 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: The Rubber Manufacturers Association estimates that 73,917 long tons of natural rubber latex were imported into the United States in 1957. A total of 1,657 long tons were re-exported, leaving a total new supply of 72,260 long tons. This sum is almost identical to the 72,013 long tons in new supply in the previous year.

According to the RMA figures, a total of 76,281 long tons of natural rubber latex were consumed last year. This is about 2,000 tons more than were consumed in the previous year. Stocks of natural rubber latex as of December 31, 1957, stood at 14,695 long tons, compared with the 12,064 long tons on hand at the end of the previous year.

Natural rubber latex is currently selling at about a 33 to 34c a pound level at East Coast ports in car load lots. At this price level, natural latex may be a bit more attractive to some consumers and it is likely that the market statistics will reflect this situation within the next few weeks.

Synthetics Although the final figures are not yet in, it seems apparent at this writing that a total of 75,000 long tons of S-type latex were produced in 1957, or about 5,000 long tons more than in the preceding year.

Neoprene latex production of 10,642 long tons in 1956 will be matched in 1957, current reports indicate. N-type latex production, estimated at 11,500 long tons in 1957, was about 1,000 long tons more than in the preceding year. Total production of synthetic latices in 1957 will total slightly more than 97,000 long tons against the 91,012 long tons produced in 1956.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the very small range of 40 points since our last report (January 2), high being 36.45c reached on January 2 and on 7 other days during the month, and low being 36.05c reached on January 24. The average price of middling uplands for the month of January was 36.31c based on 22 trading days. This compares with an average of 36.50c in the previous month.

World cotton production is estimated at 38,800,000 bales in the current season by the International Cotton Advisory Committee. This is 2,200,000 bales smaller than last season and 3,900,000 bales below the record high of 1955-56 world production.

Cotton production in the foreign Free World this season is estimated at 16,300,000 bales, up 400,000 bales from the previous season and 200,000 bales larger than in the 1955-56 season. Cotton production in Communist bloc countries totaled 11,600,000 bales this season, a decrease of 500,000 bales from last year.

World consumption is presently estimated at 42,000,000 bales, close to last season's record high consumption. The current season's estimated consumption exceeds the estimated production by some 3,200,000 bales. Stocks as of August 1, 1957, stood at 19,600,000 bales against 22,800,000 on August 1, 1956 and 24,300,000 on August 1, 1955.

The Department of Agiculture has announced the parity price for January 15 at 37.96c compared with 37.43c on December 15. The loan level has been at 32.31c during the past season.

MARKET PRICES

CHEMICALS & COMPOUNDING INGREDIENTS

FEBRUARY 3, 1958

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*Trademark. †For Export Only.

The arrangement of this section closely follows the Chemical Section of the 1957-58 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.72	.79
A-32*	lb.	.66	.80
A-100*	lb.	.52	.66
Accelerator No. 8*	lb.	—	1.25
Accelerator—49*	lb.	.59	.60
Accelerator 89*	lb.	—	1.20
Accelerator 108*	lb.	—	.92
Accelerator—552*	lb.	—	2.25
Accelerator—808*	lb.	.66	.68
Accelerator—833*	lb.	1.17	1.19
Accelerator B*	lb.	—	.89
Altax*	lb.	.54	.56
Ancap*(†)	lb.	.38	.40
Ancatax*(†)	lb.	.48	.50
Ancazate BU (ET & ME)*(†)	lb.	—	1.07
Ancazide ET*(†)	lb.	—	1.07
ME*(†)	lb.	—	1.14
Arazate*	lb.	—	2.25
Arquad 12*	lb.	.55	.61
Beutene*	lb.	.66	.68
Bismate, Rodform*	lb.	—	3.00
Butazate*	lb.	—	1.04
Butyl Eight*	lb.	1.10	1.35
Butyl Namate	lb.	.45	.50
Butyl, Ethyl & Methyl Zimate Slurry (50% solids content)	lb.	.85	.89
Captax*	lb.	.44	.46
C-P-B*	lb.	—	1.95
Cumate, Rodform*	lb.	—	1.45
Diorthotolylguanidine	lb.	.62	.63
Dipac*	lb.	—	.85
Diphenylguanidine	lb.	.54	.60
El-Sixty*	lb.	.62	.69
Ethazate*	lb.	—	1.04
50D*	lb.	—	.85
Ethyl Thiurad*	lb.	—	1.04
Ethyl Tuex*	lb.	—	1.04
Ethylac*	lb.	.93	.95
Guantal*	lb.	.62	.69
Harvex*	lb.	.70	.76
Hepteen Base*	lb.	—	1.85
Kure-Blend MT*	lb.	—	.70
Ledate, Rodform*	lb.	—	1.04
MBT-XXX*	lb.	.53	.55
Merac*	lb.	.75	1.05
Mercaptobenzothiazole	lb.	.42	.44
Mercaptobenzothiazyl Disulfide	lb.	.52	.54
Mertax*	lb.	.55	.57
Methazate*	lb.	—	1.04
Monex*	lb.	—	1.14
Mono Thiurad*	lb.	—	1.14
Morfex*	lb.	.65	.67
2-MT	lb.	—	1.00
NA-22* (for neoprene)	lb.	—	1.05
NOBS No. 1*	lb.	.76	.78
Special*	lb.	.80	.82
O-X-A-F	lb.	.55	.57
Peunac SDB*	lb.	.45	.48
Pentex*	lb.	—	1.24
Flour*	lb.	—	.30
Permalux (Neoprene)*	lb.	—	2.25
Phenex*	lb.	.55	.57
Polyac*	lb.	—	1.85
R-2 Crystals*	lb.	—	4.35
Rotax*	lb.	.55	.57
RZ-50-A*	lb.	—	1.00
B*	lb.	—	1.00
Santocure*	lb.	.76	.83
NS*	lb.	.80	.87
Selenac* (Ethyl, Methyl)	lb.	—	4.25
Seleram, Ethyl	lb.	—	3.00
Setsit-5*	lb.	.75	1.05
9*	lb.	.85	1.15
SPDX-GH*	lb.	.74	.76
GL*	lb.	1.20	1.30
Tellurac*	lb.	—	1.45
Tepidone*	lb.	.45	.48
Tetrone A*	lb.	—	1.98
Thiofide*	lb.	.54	.56
S*	lb.	.64	.66
Thionex*	lb.	—	1.14
Thiotax*	lb.	.44	.51
Thiram, Ethyl	lb.	—	1.04
Methyl	lb.	—	1.14
Thiurad*	lb.	—	1.14
Thiuram E*	lb.	—	1.04
M*	lb.	—	1.14
Trimene*	lb.	.56	.58
Base*	lb.	1.03	1.06
Triphenyl Guanidine	lb.	—	.90
Tuads* (Ethyl)	lb.	—	1.04
Tuads* (Methyl)	lb.	—	1.14
Tuex*	lb.	—	1.14
Ultex*	lb.	1.00	1.10
Unads*	lb.	—	1.14
ZB*	lb.	—	.85
ZE*	lb.	—	.85
ZM*	lb.	—	.85
Vulcacure NB*	lb.	.45	.45
NS*	lb.	.75	1.05
ZB*, ZE*, ZM*	lb.	.85	.89
Z-B-X*	lb.	—	2.45
Zenite*	lb.	.54	.56
Zenite A*	lb.	.69	.71
Zenite Special*	lb.	.55	.57
Zetax* (uncoated)	lb.	.55	.57
Zimate* (Butyl)	lb.	—	1.04
Zimate* (Ethyl)	lb.	—	1.04
Zimate* (Methyl)	lb.	—	1.04
Ziram, Butyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89
Ziram, Ethyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89
Ziram, Methyl	lb.	—	1.04
50% Dispersion	lb.	.87	.89

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.17¼	.18¼
Cottonseed Fatty Acids			
Wochem 210*	lb.	—	.16¾
211*	lb.	—	.16¾
Fish Oil, Hydrogenated, Fatty Acid			
DAR-S* (dlvd.)	lb.	.13½	.15¾
DAR-HY* (lvd.)	lb.	.16	.18½
Hydrofol Acids* (dlvd.)	lb.	.15¼	.17¼
Hyfac 430* (dlvd.)	lb.	.16¾	.19¼
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	.15¾
Neutrex* (lvd.)	lb.	.15¾	.18½
Stearex Beads* (dlvd.)	lb.	.09¾	.10¾
Stearite*	lb.	.12	.14
Talene* (dlvd.)	lb.	.17	.19½
Lime, Hydrated			
Arrowhead*	ton	—	21.00
Marblehead*	ton	—	17.75
Sierra*	ton	—	22.50
Litharge			
Eagle-Picher* (c.l.)	lb.	.18	—
SB* (dlvd.)	lb.	—	.18½
Magnesium Oxide, Heavy			
General Magnesite 500*	lb.	.05½	.06
600*	lb.	.06½	.07
Kaiser 325*	lb.	.057	.073
Michigan No. 15*	lb.	.05½	.06½
Magnesium Oxide, Light			
Carey Mag*	lb.	.25¼	.26
General Magnesite* (neoprene grade)	lb.	.30	.32
General Magnesite No. 101*	lb.	.25¼	.26
Genmeg MLW*	lb.	.25¼	.26

ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)			
K & M* (neoprene grade)	lb.	.29¼	.30
Light Calcined Magnesia No. X-01*	lb.	.25¼	.26
Maglite D*	lb.	.25¼	.26
L and M*	lb.	.29¼	.30
Michigan No. 30*	lb.	.25¼	.26
Neomag Powder*	lb.	.29¼	.30
Pellets*	lb.	.31¼	.32
Michigan No. 40*	lb.	.29¼	.30
Oleic Acid			
Emersol 210* (dlvd.)	lb.	.19½	.22
Groco Red Oil	lb.	.20	.22½
Neo-Fat 92-04*	lb.	.20½	.22½
94-04*	lb.	.18½	.20½
Wochem 310, 311	lb.	.20	.22½
Palm Fatty Acids			
Groco 45*	lb.	.15¾	.18¼
Neo-Fat*	lb.	.15¾	.17¾
Wochem 280*	lb.	.15¾	.18¼
281*	lb.	.16¼	.18¾
Potassium Oleate (dms.)	lb.	.30	.73
Red Lead			
Eagle-Picher* (c.l.)	lb.	.19	—
No. 2 RM* (dlvd.)	lb.	—	.18½
Sodium Laurate, 75%	lb.	.64	.89
Sodium Oleate, 75%	lb.	.54	.79
Paste (dms.)	lb.	.39	.64
Sodium Stearate, 75%	lb.	.54	.89
Stearic Acid, Single Pressed			
Emersol 110* (dlvd.)	lb.	.16	.18½
Groco 53*	lb.	.16½	.19
Neo-Fat 18-53*	lb.	.14¾	.16¾
Standard Pearlstearic* (dlvd.)	lb.	.16	.18½
Stearex B* (dlvd.)	lb.	.15½	.16¾
Wochem 730*	lb.	.13¼	.15¾
Stearic Acid, Double Pressed			
Choice Pearlstearic* (dlvd.)	lb.	.16½	.19
Emersol 120* (dlvd.)	lb.	.16½	.19
Groco 54*	lb.	.17	.19½
Hydrofol Acid 51RG	lb.	.13¼	.15¾
Neo-Fat 18-54*	lb.	.15¼	.17¼
Wochem 731*	lb.	.16	.18½
Stearic Acid, Other			
Extra Pearlstearic* (dlvd.)	lb.	.18¼	.21¼
Groco*	lb.	.12	.14
Neo-Fat 18*	lb.	.18½	.20½
18-58*	lb.	.14¼	.16¼
18-61*	lb.	.16¼	.18¼
Stearite*	lb.	.11¼	.13¼
Wochem 720*	lb.	.11¾	.14¼
721*	lb.	.11¾	.14¼
732*	lb.	.17	.19½
White Lead Basic Carbonate	lb.	.19	.20
White Lead Basic Sulfate	lb.	.17¼	.18¼
Zinc Laurate			
Laurex*	lb.	.33	.34
Zinc Stearate	lb.	.41	.46
Aquazinc K.C.*	lb.	.30	.55
Crown Brand*	lb.	.39	.44

Unclassified Activators

Actifat* (dms.)	lb.	—	.18
Aktone*	lb.	.21¼	.23¼
Barak*	lb.	—	.62
Curade*	lb.	.57	.59
Dibenzo G-M-F	lb.	—	2.60
D-B-A*	lb.	—	1.95
G-M-F*	lb.	—	2.60
Dibutylamine (dlvd.)	lb.	.55½	.56¼
MODX*	lb.	.36	.38
Neo Fat 42-07*	lb.	.10¼	.12¼
Ridacto* (dms.)	lb.	.25	.26
Snodotte* (dlvd.)	lb.	.19	.21½
Vimbra	lb.	.32	.38½
Vulklor*	lb.	.88	.98

ANTI-COAGULANTS

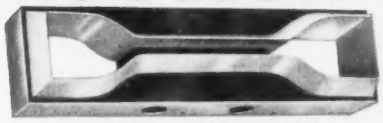
Aqua Ammonia* (dms.)	lb.	.031	.035
M.B.M.C.* (l.c.l.)	lb.	.54	.76

ANTI-FOAMING AGENTS

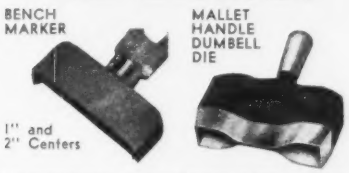
Aero Anti Foam II*	lb.	—	.20
Regular*	lb.	—	.12
Anhydrol 6991*	lb.	.51	.56
D.C. Antifoam A*	lb.	5.45	6.65
Antifoam A Emulsion*	lb.	2.05	4.00
Antifoam AF Emulsion*	lb.	2.05	2.85
Defoama W-1701*	lb.	—	.12½

HOGGSON TOOLS, MOLDS, DIES

For Rubber Testing and Production

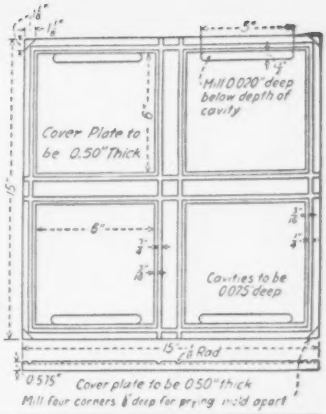


"DUMBELL" Test Strip Die D412(SIT)



For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB MOLD D15-41


Mill 0.070" deep below depth of cavity
Cover Plate to be 0.50" Thick
Cavities to be 0.075 deep
0.515" Cover plate to be 0.50" thick
Mill four corners 8 deep for prying mold apart

HOGGSON & PETTIS MFG. CO., 141A Brewery St., New Haven 7, Conn.
Pac. Coast: H. M. Royal, Inc., Downey, Calif.

EASTMAN "Lightning"
for cutting straight lines and easy curves. Automatic sharpening renews knife while machine is cutting.

It's EASTMAN for QUICK, EASY, ACCURATE RUBBER CUTTING

- **All types of Rubber—cured and uncured**
- **All types of Coated materials**
- **Rubber Sheeting and Slabs**

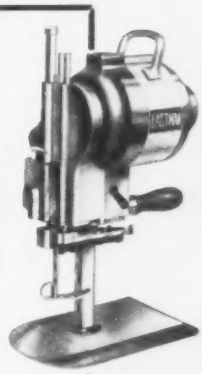
Skivers and Strip-Cutters also available.
Send for Circular

Care to try this Eastman in your own plant?

EASTMAN MACHINE COMPANY
BUFFALO 3, N. Y. Representatives everywhere

EASTMAN "Blue Streak"
for cutting intricate shapes.

Special knife edges — saw-tooth, wave-edge, etc.—and knife moistening device makes cutting easy. ONLY the Eastman automatic BELT-sharpening can sharpen these knives correctly.



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HOLLISTON BRATEX RUBBER HOLLAND

works equally well for hot or cold processing

*strong and pliable
*clean peeling
*non-flaking
*uniform caliper
*surface gloss
*20" and 40" widths
*100 and 250 yard rolls
*3 grades

*special size rolls made to order

THE HOLLISTON MILLS, INC., NORWOOD, MASS.
NEW YORK • PHILADELPHIA • CHICAGO • MILWAUKEE • SAN FRANCISCO

ANTI-FOAMING AGENTS (Cont'd)

Defoamer A-25*	lb.	——	3.00
Defoamer 630*	lb.	——	.14
Deltyl Prime	lb.	.70	.80
G-E Antifoam SS-24*	lb.	5.30	6.65
SS-66*	lb.	5.30	6.65
60 Emulsion*	lb.	2.05	3.75
Igepol CO-210	lb.	——	.36
Kessco X-3* (dms.)	lb.	——	.35
X-180*	lb.	——	.29¾
X-181*	lb.	——	.38½
Nopco 1407*	lb.	.19½	.20½
1497-V*	lb.	.13¾	.14¼
1907-B*	lb.	.18¼	.19¼
JMK*	lb.	.48	.49
JMU*	lb.	.22½	.23½
JMY*	lb.	.19¼	.20¼
Pluronic L61*	lb.	.33½	.39
RS-968*	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.35	.50
Tributyl Phosphate (dms.)	lb.	.52½	.53½

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	2.00
AgeRite Alba*	lb.	2.40	2.50
Gel*	lb.	.70	.72
Hipar*	lb.	1.05	1.07
H.P.*	lb.	.79	.81
Powder*	lb.	.57	.59
Resin*	lb.	.88	.90
Resin D*	lb.	.57	.59
Spar*	lb.	.57	.59
Stalite*	lb.	.57	.59
Stalite S*	lb.	.57	.59
Superlite*	lb.	.57	.59
White*	lb.	1.50	1.60
Akroflex C*	lb.	.85	.87
CD*	lb.	.79	.81
Aminox*	lb.	.57	.59
Antioxidant 425*	lb.	2.47	2.50
Antioxidant 2246*	lb.	1.50	1.53
Antox*	lb.	.59	.61
Aranox*	lb.	——	3.25
Benzoquinone	lb.	1.50	1.75
Betanox Special*	lb.	.91	.93
B-L-E*	lb.	.57	.59
B-X-A*	lb.	.55	.57
Catalin CAO No. 1*	lb.	.91	.93
CAO No. 5*	lb.	1.49	1.50
Deenax*	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.86	1.16
Eugenol C-95%*	lb.	2.30	2.50
Flectol H*	lb.	.57	.64
Flexamine*	lb.	.79	.81
Ionol* (dms.)	lb.	.91	.95
Neozone A*	lb.	.64	.66
C*	lb.	.86	.88
D*	lb.	.57	.59
Nevastain A*	lb.	.51	.61
B*	lb.	.51	.70
Nullapon BF-12*	lb.	——	.21½
BF-13*	lb.	——	.25½
BF-78*	lb.	——	.55
BF-Acid*	lb.	——	.85
Octamine*	lb.	.57	.59
Oxidex*	lb.	——	3.60
PDA-10*	lb.	.46	.48
Permalux*	lb.	——	2.25
Polygard*	lb.	.59	.59
Santoflex AW*	lb.	.79	.86
DD*	lb.	.57	.64
75*	lb.	1.01	1.08
Santovar-A*	lb.	1.55	1.57
Santowhite Crystals*	lb.	1.55	1.62
Santowhite L*	lb.	.57	.64
MK*	lb.	1.25	1.32
Powder*	lb.	1.55	1.62
Sequestrene AA*	lb.	.76	.85
NA2*	lb.	.62	.70
NA3*	lb.	.61	.69
Stabilite*	lb.	.55	.57
Alba*	lb.	.74	.79
FLX*	lb.	.76	.78
L*	lb.	.63	.65
White*	lb.	.52	.54
White Powder*	lb.	.41	.43
Stabilizer No. 1*	lb.	1.55	1.80
Stabilizer No. 9-A*	lb.	.80	1.05
Styphen I*	lb.	.51	.55
Sunolite*	lb.	.16	.22
Tecquinol*	lb.	.82½	.84½
Tannic Acid, Tech.	lb.	.46	.48
Tenamene 3*	lb.	.91	.95
Thermoflex A*	lb.	1.05	1.07
V-G-B*	lb.	.75	.77
Wing-Stay S*	lb.	.53	.57

ANTIOZONANTS

Eastozone 30*	lb.	1.24	1.26
31*	lb.	1.24	1.26
32*	lb.	1.72	1.74
UOP 88* & 288* (dms)	lb.	——	1.26

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.34	.40
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder PD*	lb.	.37	.39
W*	lb.	——	.42
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	.38
Arquad S*	lb.	.38	.44
Formaldehyde (dms.)	lb.	.06	.076
G-4* (bbls.)	lb.	1.09	1.29
G-11*	lb.	1.98	2.08
Halane*	lb.	.40	.47
Ortho Cresol (26°—27°)	lb.	.14	.16¼
Preventol GD	lb.	——	1.09
Retarder D*	lb.	.42	.50
Vancide	lb.	——	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.13	6.50
Webnix 34-L*	lb.	1.25	1.75
69-C*	lb.	1.50	2.25

AROMATICS (DEODORANTS)

Airkem 115*	gal.	——	6.50
122*	gal.	——	6.50
186*	gal.	——	6.50
Alamask AA*	lb.	——	3.00
AF*	lb.	——	2.50
AO*	lb.	——	1.50
AR*	lb.	——	.50
BG*	lb.	——	1.15
BGM*	lb.	——	.60
CY*	lb.	——	2.40
DJ*	lb.	——	3.35
DL*	lb.	——	1.95
H*	lb.	——	5.50
LD*	lb.	——	.75
ND*	lb.	——	2.75
O*	lb.	——	6.50
OS*	lb.	——	5.25
Bouquet 149*	lb.	——	3.00
Coumarin*	lb.	——	3.70
Curodex 19*	lb.	4.75	4.90
188*	lb.	5.75	5.90
198*	lb.	6.75	6.90
Deodorant 65*	lb.	——	1.85
Deodorant L-37*	lb.	2.15	2.25
L-44*	lb.	2.65	2.75
N.L.T.X.*	lb.	1.90	2.00
Deodorant Oil GD 6422*	lb.	1.90	2.20
GD 6423*	lb.	1.60	1.90
GD 6575*	lb.	2.40	2.90
GD 31063*	lb.	2.25	2.75
Ethavan*	lb.	6.20	6.25
Latex Perfume 17326	lb.	——	4.00
18301	lb.	——	3.00
22258	lb.	——	2.50
Naugaromes* (dms.)	lb.	.60	3.00
Neutroleum Delta*	lb.	——	2.60
Gamma*	lb.	——	3.60
Parador A*	lb.	1.80	2.10
C*	lb.	2.00	2.50
E*	lb.	.25	.40
GD 5280*	lb.	2.00	2.50
GD 53481*	lb.	1.70	2.00
Perfume Oil Bouquet Vanilla M*	lb.	1.60	1.70
Rodo No. 0*	lb.	4.00	4.50
No. 10*	lb.	5.00	5.50
Rubbarome* (dms.)	lb.	.60	3.80
Rubber Perfume 12*	lb.	——	4.35
Russian Leather 7*	lb.	——	4.35
Vanillin	lb.	2.75	2.80

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	——	8.00
Better Blend Soda* (c.l., bags)	cwt.	——	2.55
Blowing Agent No. 81105	lb.	.32	.35
Celogen*	lb.	——	1.95
AZ*	lb.	——	1.95
Diazo Amino Benzene	lb.	——	.73
Kempore R-125	lb.	——	1.95
Neo Fat 42-12*	lb.	.10¼	.12¼
Opex 40	lb.	——	.76
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	2.40
Sponge Paste*	lb.	——	.20
Unicel ND*	lb.	——	.76
S*	lb.	——	.20
Urea	lb.	.06	.07

BONDING AGENTS

Base 6986*	lb.	.27	.32
Braze*	gal.	6.00	9.00
Chemlok 201, 203, 220, 401, 607	gal.	5.00	24.00
614	lb.	4.35	4.75
Cover Cement*	gal.	2.50	4.00
Durez 12987*	lb.	——	.54
Gen-Tac Latex*	lb.	.70	.75
Hylene M*	lb.	3.50	3.75
M-50*	lb.	1.90	2.15
Penacolite B1A*	lb.	——	.95
R-2710*	lb.	——	.95
Pliobond 20*	gal.	2.91	4.23
30*	gal.	3.65	4.97
Rex Compounds*	gal.	1.30	1.90
Thixons*	gal.	3.30	9.00
Ty-Ply Q (BN & S)*	gal.	6.75	8.00
Tygobond 30*	gal.	5.50	7.45
Vinculux	gal.	——	4.95

COAGULANTS

Acetic Acid—56% (bbls.)	cwt.	9.00	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Flake	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	——	.09½
Zinc Nitrate, Tech. Flake	lb.	——	.20

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	.10½
M*	lb.	.10½	.11
R*	lb.	.10¾	.11½
S*	lb.	.11¾	.12¼
Black Shield 4-35* (dms)	lb.	.09	.09½
No. 5	lb.	.10	.10½
No. 6	lb.	.09	.09½
L-1404B	lb.	.10½	.11
Carbon Black—See *Reinforcing Agents*			
Cooke 1026*	lb.	——	2.50
Lampblack No. 10*	lb.	.06	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¼	.14½
Pure Black Iron Oxide	lb.	.14¼	.14½

Blue

Akron Masterbatches*	lb.	2.23	2.78
Toners*	lb.	2.30	6.35
Blue Powders	lb.	2.20	3.75
Cooke M.B. Blue*	lb.	2.20	3.75
Disco Blues	lb.	2.20	3.45
Monastral Rubber Blue CPL*	lb.	——	1.95
PCD, Dispersed*	lb.	——	2.55
Peacoline Blue*	lb.	——	3.85
Ramapo Blue*	lb.	2.75	3.00
Rubber Blue GD* (Disp.)	lb.	——	4.75
Rubber Blue X-1999*	lb.	——	1.90
Rubber Dispersed Blues	lb.	2.52	2.78
Solfast Sky Blue*	lb.	3.00	3.60
Stan-Tone MBS*	lb.	1.55	4.55
GPE*	lb.	——	2.50
PC*	lb.	1.40	1.80
Ultramarine	lb.	.14	.30
Vansul Blue M.B.*	lb.	.95	2.60

Brown

Brown Iron Oxide	lb.	.15¼	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¼	.15½
Stan-Tone GPE*	lb.	——	3.00
Vansul Brown M.B.* (Organic)	lb.	——	2.15

Green

Akron Masterbatches*	lb.	1.38	3.08
Toners*	lb.	1.35	4.95
Cooke M.B. Green*	lb.	1.60	2.80
1013*	lb.	——	2.80
Disco Greens	lb.	1.55	2.80
Green Powders	lb.	1.35	3.95
Monastral Rubber Green GSD* (Dispersed)	lb.	——	2.80
GSL*	lb.	——	2.20
Permansa Green CP-594*	lb.	——	1.35
Pigment Green B*	lb.	——	1.35
GL-652D*	lb.	.90	.95
Ramapo Green*	lb.	——	3.50
Rubber Dispersed Greens	lb.	1.23	3.08
Rubber Green FD* (Disp.)	lb.	——	2.05
Rubber Green X-1292*	lb.	——	1.75
Solfast Green*	lb.	——	3.95
Stan-Tone MBS*	lb.	1.55	3.35
GPE*	lb.	3.00	4.50
PC*	lb.	1.70	3.80
Vansul Green M.B.*	lb.	1.05	2.90

Maroon

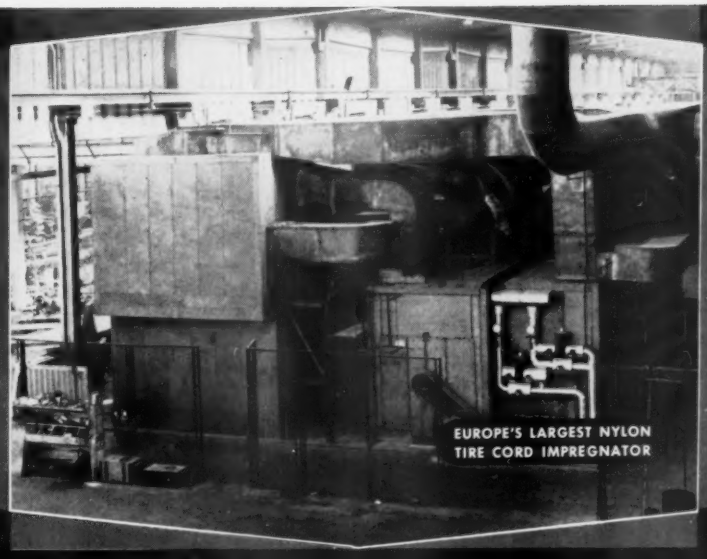
Akron Masterbatches*	lb.	——	4.10
Toners*	lb.	2.00	4.00
Pyrolux Maroon*	lb.	——	3.65
Vansul Maroon M.B.*	lb.	——	3.35

Orange

Akron Masterbatches*	lb.	2.42	2.77
Toners*	lb.	2.82	4.00
Benzidene Orange	lb.	——	3.10
Cooke MB*	lb.	2.25	2.35
1021*	lb.	——	2.25
Dianisidine Orange*	lb.	——	2.70
Disco Oranges	lb.	2.30	2.85
Mercadium X-2667*	lb.	——	1.64
Molybdate Orange	lb.	——	.48
Oswego Orange X2065*	lb.	——	3.15
Rubber Orange OD* (Disp.)	lb.	——	2.25
Stan-Tone Cadmium Dry*	lb.	2.10	2.20
Cadmium Paste*	lb.	2.47	3.20
GPE*	lb.	1.20	4.35
PC*	lb.	.75	2.75
Vansul Orange M.B.*	lb.	2.40	2.45

Red

Akron Masterbatches*	lb.	1.00	3.53
Toners*	lb.	.88	5.60
Arcturus Reds*	lb.	——	1.20
Antimony Trisulfide	lb.	.72	.78
R.M.P. Sulfur Free*	lb.	——	.78
R.M.P. No. 3*	lb.	——	.72
Brilliant Toning Reds*	lb.	1.65	1.90
Cadmolith Red* (dms.)	lb.	1.94	2.87
Cooke M.B. Red*	lb.	1.05	3.25
1010*	lb.	——	1.75
Disco Reds	lb.	1.05	3.25
Graphic Red* (dlvd.)	lb.	.93	.98
Kroma Reds*	lb.	.14	.15
Lake Red C*	lb.	——	1.20
Mapico Reds* (50 lb. bags)	lb.	.13¾	.14
Mercadium X-2668 Light*	lb.	——	1.73
X-2669 Medium Light*	lb.	——	1.82
X-2670 Medium*	lb.	——	1.90
X-2671 Dark*	lb.	——	2.00



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COLORING AGENTS (Cont'd)

Red (Cont'd)

Oximony Red Iron Oxide	lb.	.12¾	.13
Polaris Red*	lb.	——	1.65
Recco Red Oxide*	lb.	.12	.13
Red Iron Oxide, Light	lb.	.13¾	.14
Red Powders	lb.	——	4.40
Rubber Dispersed Reds	lb.	1.47	3.58
Rubber Red PBD* (Disp.)	lb.	——	2.05
2BD, Dispersed*	lb.	——	2.00
2BL*	lb.	——	1.24
PBL*	lb.	——	1.24
Rubanox Reds*	lb.	1.40	1.50
Rubber Red CP-339* (dlvd.)	lb.	——	1.10
Rubber Red X-1148*	lb.	——	.93
Solfast Red*	lb.	1.40	1.50
Stan-Tone MBS*	lb.	1.20	3.53
GPE*	lb.	1.65	2.00
PC*	lb.	1.30	2.50
PDS*	lb.	1.40	1.55
PVC*	lb.	1.65	1.90
Vansul Red M.B.*	lb.	1.00	3.35
Watchung Red*	lb.	1.65	1.90

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.22¾	.2300
20* (50 lb. bags)	lb.	.22¾	.2300

White—Lithopone

Eagle-Picher*	lb.	.0800	.0975
Permolith*	lb.	.08373/4	.09123/4
Sunolith*	lb.	.0800	.0875

White—Titanium Pigments

Horse Head Anatase Grades*	lb.	.25½	.26½
Rutile Grades*	lb.	.25½	.26½
Stan-Tone PC*	lb.	——	.55
Ti-Cal*	lb.	.09	.09¾
R-22*, R-25*, R-27*, R-30*	lb.	.09⅜	.09⅞
R-60*	lb.	.09⅜	.10⅛
Ti-Pure*	lb.	.24½	.27½
Anatase Grades*	lb.	.25½	.26½
Rutile Grades*	lb.	.27½	.28½
Titanox A*—all grades (dlvd.)	lb.	.24½	.25½
C-50* (dlvd.)	lb.	.13⅞	.14⅜
RA* (dlvd.)	lb.	.26½	.27½
RA-10* (dlvd.)	lb.	.26½	.27½
RA-NC* (dlvd.)	lb.	.26½	.27½
RC* (dlvd.)	lb.	.09¾	.09¾
RC-HT* (dlvd.)	lb.	.09	.09½
Unitane O-110*	lb.	.25½	.26½
O-220*	lb.	.25½	.26½
O-310*	lb.	.25½	.26½
O-410*	lb.	.25½	.26½
OR-150*	lb.	.27½	.28½
OR-250*	lb.	.27½	.28½
OR-340*	lb.	.27½	.28½
OR-342*	lb.	.27½	.28½
OR-350*	lb.	.27½	.28½
OR-540*	lb.	.27½	.28½
OR-640*	lb.	.27½	.28½
Zopaque*	lb.	.24½	.25½
R*	lb.	.26½	.27½

White—Zinc Oxide (American Process)

AZO-DOX 44, 45	lb.	.1450	.1550
AZO-ZZZ 11* (22*, 33*, 44*, 55*)	lb.	.1450	.1550
Eagle-Picher AAA*	lb.	.1450	.1550
Horse Head Special*	lb.	.1450	.1550
XX*	lb.	.1450	.1550
Protox 166*	lb.	.1450	.1550
167*	lb.	.1450	.1550
267* (pelleted)	lb.	.1450	.1550
St. Joe Black Label*	lb.	.1450	.1550
Green Label*	lb.	.1450	.1550
Red Label*	lb.	.1450	.1550
Pelleted	lb.	.1450	.1550

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	——	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450	.1550
Florence Green Seal*	lb.	.1625	.1725
Red Seal*	lb.	.1575	.1675
White Seal*	lb.	.1675	.1775
Kadox 25*	lb.	.1675	.1775
15*, 17*, 72* & 515*	lb.	.1450	.1550
Protox 168*	lb.	.1450	.1550
169*	lb.	.1450	.1550
268* (pelleted)	lb.	.1450	.1550
U.S.P. (cartons)	lb.	.1775	.1875
XX-78*	lb.	.1450	.1550

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530	.2630
Lehigh 35%*	lb.	.1550	.1650
50%*	lb.	.1585	.1685

COLORING AGENTS (Cont'd)

Yellow

Akron Masterbatch*	lb.	1.12	2.18
Toners*	lb.	2.10	6.00
Benzidene-Lightfast	lb.	3.25	5.10
Benzidine Yellow	lb.	2.20	2.55
Cadmolith Yellow (dms.)	lb.	1.12	1.20
Chrome Yellow	lb.	——	.35
Cooke M.B. Yellow 405*	lb.	2.15	2.75
105*	lb.	——	2.15
Disco Yellows	lb.	2.05	3.95
Iron Oxide, Pure			
Light Shades	lb.	.12	.12¼
Dark Shades	lb.	.11½	.11¾
Mapico Yellow* (50 lb. bags)	lb.	.12	.12¼
Rubber Dispersed Yellows	lb.	1.27	2.13
Rubber Yellow GD* (disp.)	lb.	——	2.25
GL*	lb.	——	1.68
Rubber Yellow X-1940*	lb.	——	2.35
Stan-Tone Cadmium Dry*	lb.	2.80	3.03
Cadmium Paste*	lb.	1.63	1.99
MBS*	lb.	1.30	2.20
GPE*	lb.	4.25	4.50
PC*	lb.	.55	3.40
Sumatra Yellow X-1940*	lb.	——	2.45
Toluidine Yellow	lb.	2.20	2.30
YL-660 D*	lb.	1.25	1.35
Oximony Iron Oxide	lb.	.12¾	.13
Vansul Yellow M.B.*	lb.	1.00	2.00
Yellow Powders	lb.	2.00	5.00
Zinc Yellow	lb.	——	.29

DISPERSING AGENTS

Anchoid*(†)	lb.	.24	.25
Anhydrapent*	lb.	.56	.59
Armeen 18*	lb.	.39	.45
Blancol*	lb.	——	.15¾
Darvan No. 1*, No. 2*, No. 3*	lb.	.22	.30
Daxad 11* (21*, 23*)	lb.	.08	.30
Diethanolamine (dms., dlvd.)	lb.	.24½	.27½
Dispersaid*	lb.	1.25	1.35
Emcol K-8300* (dms.)	lb.	.14	.18
P10-59	lb.	.32	——
5120	lb.	.31	——
5138	lb.	.31	——
Emulphor ON-870*	lb.	——	.55
Furala*	lb.	.06½	.07½
Halloid*	lb.	.04½	.05½
Hycryl A-1000*	lb.	.09	.09½
Igepal CO-630*	lb.	——	.29
Igepon T-73*	lb.	——	.29½
Kyro EO* (dms.)	lb.	——	.29¾
Leonil SA*	lb.	——	.55
Lomar PW*	lb.	——	.18
Marasperse C*	lb.	.06¼	.06¾
CB*	lb.	.13	.15
N*	lb.	.09½	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25	.28
Naccotan A*	lb.	.16½	.17
Nekal BA-75*	lb.	——	.40
BX-78*	lb.	——	.64
Nopco 1187-X*	lb.	.15	.16
Pluronic F68*	lb.	.38½	.44
Polyfon*	lb.	.08	.09
R & R 551*	lb.	——	.28
Rubbex*	lb.	.247	.277
Stablex B*	lb.	.50	.95
Stan-Chem BQC*	lb.	.12¼	.17¼
1067*	lb.	——	.13½
1471*	lb.	.1687	.2187
2251*	lb.	.12¼	.17¼
Trenamine D-25*	lb.	.32½	.36
Triethanolamine (dms., dlvd.)	lb.	.22	.25
Yelkin TT* (and TTS*)	lb.	.13	.16

EXTENDERS

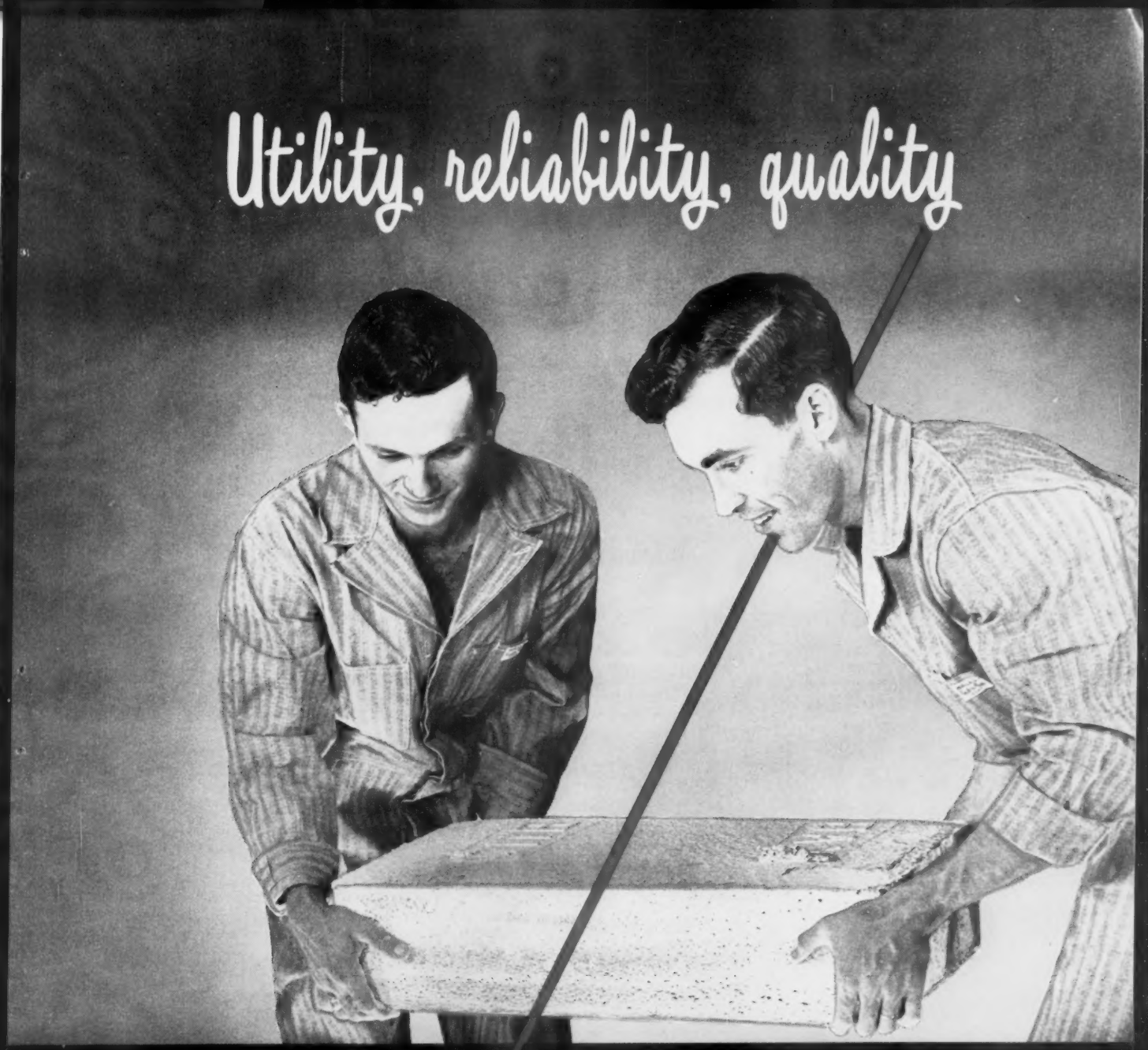
Arcco 1071-13B*	lb.	.14½	.15½
1073-18B*	lb.	.13½	.14½
1294-36B*	lb.	.11½	.12½
Car-Bel-Ex-A* (and B*)	lb.	——	.14
Extender 600*	lb.	——	.1765
Facile Gum 4A*	lb.	.48	.50
Millex*	lb.	——	.07
W*	lb.	——	.07
Nopco 2271*	lb.	.15½	.16½
Polyco 418*	lb.	.17	.18
PR-162 Latex Extender*	lb.	——	.182
Solvitose HDF*	lb.	.22	.25
Synprolac*	lb.	.16	.23
Synprowax*	lb.	——	.23
Vistanex MM Grades*	lb.	——	.35

FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.21½	1.35
Lionite*	lb.	.16	1.27
Pumice	lb.	.03	.05
Walnut Shell Grits	lb.	.05	.08
Aluminum Hydrate	lb.	.0850	.1200
Kaiser Alumina*	lb.	.026	.059
Aluminum Silicate			
AFD*	ton	29.50	36.00
Aluminum Flake*	ton	29.50	36.00
Marter White*	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	101.50	121.50

FILLERS (Cont'd)

Barytes			
No. 1 Floated, White*	ton	45.00	65.10
No. 2 Floated, Unbleached*	ton	43.00	63.10
No. 22 Barytes* (c.l.)	ton	——	30.00
No. 3805 Barytes*	ton	22.00	26.75
Foam A*	ton	——	55.00
Sparmite*	ton	80.00	85.00
XIOR*	ton	80.00	85.00
Bentonite (c.l.)	ton	——	13.50
Argosite Clay* (c.l.)	ton	——	12.50
Bennett Clay* (c.l.)	ton	——	32.50
SPV Volclay* (c.l.)	ton	——	12.50
White Hi-Gel*	ton	——	65.90
Blanc Fixe	ton	125.00	142.00
Calcium Carbonate			
Atomite* (c.l.)	ton	——	32.50
B.I. White No. 1 (c.l.)	ton	——	9.00
Calcene NC*	ton	80.00	100.00
TM*	ton	82.50	102.50
Calwhite*	ton	——	20.00
Camel-Carb*	ton	——	12.00
Camel-Tex*	ton	——	20.00
Camel-Wite*	ton	——	32.50
Duramite*	ton	——	20.00
Gamaco* (c.l.)	ton	——	32.50
Georgia Marble 5-25* (c.l.)	ton	——	20.00
No. 10 White* (c.l.)	ton	——	11.00
Kalite*	ton	52.50	67.50
Laminar*	ton	——	30.00
Lesamite* (c.l.)	ton	——	27.50
Lorite*	ton	30.00	36.00
Millical*	ton	38.00	53.00
Multifex MM*	ton	117.50	137.50
Non-Fer-Al*	ton	35.00	50.00
Purecal M*	ton	56.75	80.75
SC* (and T*)	ton	110.00	125.00
U*	ton	120.00	135.00
Rambo No. 1*	ton	——	10.50
Snowflake*	ton	17.00	20.00
Super Multifex*	ton	167.50	187.50
Surfex*	ton	42.00	57.00
Suspenso*	ton	38.00	43.00
Witcarb Reg.*	ton	56.75	85.00
P*	ton	110.00	140.00
R*	ton	120.00	150.00
RC*	ton	110.00	140.00
York White*	ton	——	10.50
Calcium Silicate			
Silene EF*	lb.	.06	.07
Calcium Sulfate, Anhydrous			
Snow White Filler*	ton	——	21.00
Calcium Sulfate Hydrous			
Terra Alba No. 1*	ton	——	17.00
Chalk Whiting (l.c.l.)	lb.	.01½	.01¾
Recco Paris Whiting*	ton	——	35.00
OMYA Whiting*	ton	——	30.00
Clay			
Afton Clay*	ton	12.00	35.50
Aiken Clay*	ton	14.50	——
Alsilite* (c.l.)	ton	30.00	45.00
Aluminum Flake*	ton	25.50	28.50
Buca* (c.l.)	ton	——	45.00
Burgess No. 20*	ton	——	35.00
No. 30*	ton	——	37.00
Burgess Iceberg*	ton	——	50.00
Catalpo* (c.l.)	ton	——	35.00
Champion*	ton	——	14.50
Crown*	ton	——	14.00
Dixie* (c.l.)	ton	——	14.50
Franklin Clay—R* (c.l.)	ton	15.00	39.00
G. K. Soft*	ton	11.00	28.00
Harwick Clays*	ton	14.50	57.00
Hi-White R*	ton	——	13.50
Kaolloid Clay* (c.l.)	ton	——	10.50
LGB*	ton	17.50	22.50
LGP*	ton	20.00	25.00
McNamee* (c.l.)	ton	——	14.50
Natka 1200 (c.l.)	ton	——	13.00
Par* (c.l.)	ton	——	13.00
Paragon*	ton	14.50	19.50
Pigment 5*	ton	27.50	34.50
33*	ton	——	37.00
Recco* (c.l.)	ton	——	14.00
Swanee Clay*	ton	——	12.50
Snobrite*	ton	——	12.50
Suprex*	ton	14.50	19.50
Whitetex* (c.l.)	ton	——	50.00
4200 Clay*	ton	13.00	——
Diatomaceous Earth	ton	30.00	50.00
Kaylorite* (c.l.)	ton	——	30.00
Lorite*	ton	——	36.00
Flock			
Cotton (White)	lb.	.28	.32
Colored	lb.	.11	.13½
Filfloc F 40-9000*	lb.	——	.13
F 6000*	lb.	——	.36
Polycel*	ton	110.00	210.00
Rayon, Bleached or Dyed	lb.	.75	1.20
Rayon, Grey	lb.	——	.18
Rayon, Pink	lb.	——	.20
Solka-Floc* (l.c.l.)	lb.	.07	.16
Glue, Amber	lb.	.17	.19
Ground Softwood Bark			
Silvacon* (c.l.)	ton	55.00	100.00
Leather			
Flour (dust)	lb.	.12	.15
Shredded	lb.	.05	.17
Lignin	lb.	.06	.08
Indulin*	lb.	.06	.08



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MASTERBATCHES
RUBBERS OF SCIENCE

SYNTHETIC
BAYTOWN
RUBBER

The switch to Masterbaches is impressive

It is just good common sense to standardize on **MASTERBATCHES**, especially on **BAYTOWNS**. They simplify warehousing, materials handling and mixing, and result in all-around better economy. They give added mileage to tires and, what is equally important, less cracking.

There are **BAYTOWN MASTERBATCHES** of every description specifically formulated to conform with your needs as to butadiene-styrene polymer, oil extension, emulsifier, stabilizer, type black and loading, and even compounding oil.

BAYTOWN MASTERBATCHES are of outstanding quality for processing and reinforcement. They are ever dependable for uniformity from shipment to shipment.

Be up to date. Go the **MASTERBATCH** way — **BAYTOWN**, of course — and thus join the leaders. For exceptional good results rely on **UNITED**. We will gladly help you.

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

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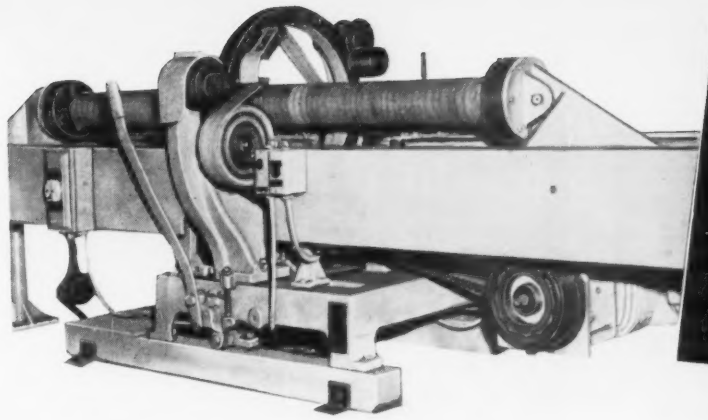


PIERCE MODEL IR PROCESS ROLLER WRAPPER

Saves Time, Labor, Money

Fast, Efficient, Economical, this new Pierce Wrapper is designed especially for wrapping large, rubber covered rollers for vulcanization.

- Compression is controlled by uniform application of nylon or cotton tape wrap.
- Saves time — substantially faster than lathe application.
- Provides dependably uniform results — reduces labor and grinding required.
- Has adjustable, positive-controled overlap.
- Shuttle may be driven separately for lapping at start or on the ends.
- Roll feed is reversible for doubling back while wrapping.

Write or wire for full details.

Pierce Wrapping Machine Company
1100 E. 31st St., LaGrange Park, Illinois

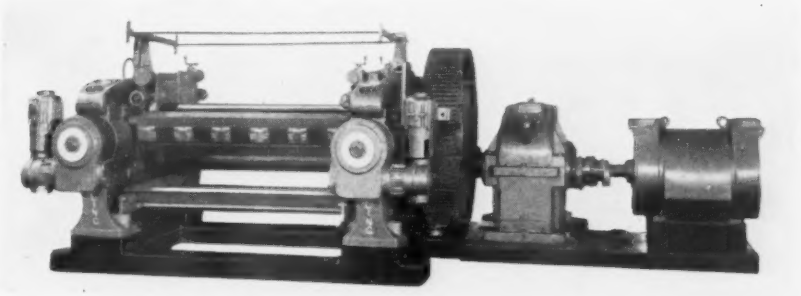
STEWART BOLLING . . . your RELIABLE source

for General and Special Purpose Mills

. . . and other equipment for individual needs

You may be surprised to learn how readily standard Stewart Bolling mills and other machines can be adapted to special and most exacting requirements. This refers particularly to our 11 sizes of mills, from the 2½"x7" laboratory model to 26"x 100" production mills for standard temperatures or up to 500° F. for specialized applications.

★ ★ ★



This special Frame No. 7 mill was developed primarily for silicones. Features: rolls 22" dia., 72" face; motorized roll adjustment, tilting type easy cleaning guides, special roll scraper. Here is just one more example of Stewart Bolling versatility in designing and building equipment for special uses in rubber and plastics fields.

STEWART BOLLING & COMPANY, INC.
3195 EAST 65th STREET • CLEVELAND 27, OHIO

• INTENSIVE MIXERS AND MILLS • CALENDERS • REFINERS • CRACKERS HYDRAULIC PRESSES • PUMP UNITS BALE SLITTERS • SPEED REDUCERS

FILLERS (Cont'd)

Limestone, Pulverized	ton	3.00	5.00
Asbestol Regular*	ton	27.00	29.00
Asbestol Superfine*	ton	32.00	34.00
Georgia Marble No. 10*	ton	—	11.00
Industrial Filler No. 100*	ton	—	5.75
Micro Velva A*	ton	49.00	51.00
L*	ton	57.00	59.00
No. 1 White*	ton	—	10.00
Magnesium Carbonate	lb.	.12½	.15
K & M Clearcarb*	lb.	—	.14
Technical* (c.l., eqld.)	lb.	.10½	.12
Marinco CL*	lb.	—	.17
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼	.07¾
Concord*	lb.	.08	.08¾
Micro-Mica*	lb.	.08	.08¾
Mineralite* (c.l.)	ton	40.00	85.00
Silversheen*	lb.	.08	.08¾
Triple A Mica* (c.l.)	ton	—	30.00
Vermiculite*	lb.	—	.11
Wet Ground Biotite Mica	lb.	.06½	.07¼
Wet Ground Mica No. 160*	lb.	.08	.08¾
Pecan Shell Flour Stan Shell*	ton	45.00	75.00
Pyrophyllite No. 261*	ton	—	11.50
Pyrax A* (c.l.)	ton	14.50	15.00
WA* (c.l.)	ton	17.00	17.50
Sawdust, Graded	ton	14.00	35.00
Silica	ton	16.00	27.00
Extra Fine (bags) (c.l.)	ton	—	43.00
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Lo-Micron Slate Flour*	lb.	—	.04½
No. 133 Slate Flour*	ton	—	4.55
Sodium Silico Aluminate Zeolex 23*	ton	120.00	140.00
Talc (Magnesium Silicate) Asbestol Regular*	ton	—	27.00
Eastern RC-500*	ton	—	32.00
No. 41*	ton	—	19.70
No. 549*	ton	—	63.00
French*	ton	—	59.00
L.S. Silver*	ton	33.75	38.75
No. 367*	ton	—	13.00
No. 1600*	ton	—	70.60
No. 1768*	ton	—	13.00
Nytal 200* (c.l.)	ton	—	28.00
300* (c.l.)	ton	—	38.00
Sierra Fibrene C-400*	ton	33.00	38.00
Supreme 325*	ton	46.25	57.25
Sierra White*	ton	20.75	31.75
Soapstone*	ton	—	13.00
Walnut Shell Flour	ton	55.00	100.00
Stan-Shell*	ton	50.00	84.00
Whiting, Commercial	ton	—	7.50
Allied Whiting*	ton	10.50	21.50
Camel-Carb*	ton	—	10.00
Calwhite (c.l.)	ton	—	20.00
C-C-O White*	ton	—	22.00
Georgia Marble No. 15*	ton	—	20.00
No. 16*	ton	—	20.00
Piqua No. 1 YAA* (c.l.)	ton	1.00	10.00
No. 2 LS* (c.l.)	ton	1.00	10.00
Snowflake* (c.l.)	ton	—	20.00
Stan-White 325*	ton	11.50	14.10
Veroc* (c.l.)	ton	—	10.50
Welco* (c.l.)	ton	—	10.50
York White R* (c.l.)	ton	—	10.00
Wood Flour	ton	31.50	48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	2.35
Black Out*	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.50	.60
VanWax*	gal.	1.45	1.50

FLAME RETARDANTS

Celluflex CEF* (dms.)	lb.	—	.65
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
Halowax*	lb.	.36	.46
Zinc Borate 3167*	lb.	.1920	.2020
Zyrox Compounds*	lb.	.38	.95½

LATEX MODIFIERS

Ludox	lb.	.15	.16¾
OPD-101*	lb.	—	.28
Piccopale A-1 Emulsion	lb.	.086	.107
Ubatol U-2001* (dms.)	gal.	1.84	1.87

LUBRICANTS, MOLD

Akro Gel*	lb.	—	.165
Alipal CO-433*	lb.	—	.20
CO-436*	lb.	—	.24
Aluminum Stearate Crown Brand*	lb.	.37	.42
Amine, Mixed Crude*	lb.	.19	.25
Aquadag*	lb.	3.50	4.00
Aquarex D*	lb.	—	.78
E*	lb.	—	.94
ME*	lb.	—	.80
MDL*	lb.	—	.33
WAQ*	lb.	—	.22
Armeen HT*	lb.	.34	.40
180*	lb.	.52	.56

LUBRICANTS, MOLD (Cont'd)

Armid HT (flaked)*	lb.	.42	.46
0*	lb.	.39	.41
Borax, Granular (l.c.l.)	ton	89.00	94.00
Carbowax 4000*	lb.	.31	.32
CD Mold Release B*	gal.	5.00	—
B-2*	gal.	5.00	—
Colite Concentrate* (dms.)	gal.	.90	1.15
Colite D43D*	gal.	1.15	1.40
Concentrex*	lb.	—	.25
Dag Dispersions No. 197*	lb.	1.85	2.90
D.C. 7 Compound*	lb.	5.13	6.50
D.C. Emulsion No. 7*	lb.	1.59	2.07
No. 8*	lb.	1.22	1.76
No. 35*	lb.	1.22	1.76
No. 35A*	lb.	1.22	1.76
No. 35B*	lb.	1.22	1.76
No. 36*	lb.	1.22	1.76
D.C. Mold Release Fluid*	lb.	3.14	4.75
Dri-Lube*	lb.	—	.22
Emulsion Lubricant A80*	lb.	—	1.80
45*	lb.	—	1.80
G-E Silicone Emulsion SM-55*	lb.	1.22	1.76
SM-61*	lb.	1.22	1.76
SM-62*	lb.	1.22	1.76
G-E Silicone Fluid SF-93*	lb.	3.14	4.25
SF-96*	lb.	3.14	4.25
Glydag G*	lb.	1.30	2.45
Hawkeye Flake* (dlvd.)	lb.	.15	.15¾
HSC No. 35*	lb.	1.22	2.46
No. 515	lb.	1.22	2.46
Igepal CO-430*	lb.	—	.29
CO-630*	lb.	—	.29
CO-530*	lb.	—	.29
Igepon AP-78*	lb.	—	.48
T-33*	lb.	—	.21
T-51*	lb.	—	.13½
Kokobace R*	lb.	.17½	.18½
Lubrex	lb.	.25	.30
Lubri-Flo*	gal.	10.00	12.00
Migralube*	lb.	—	.35
ML-1027-2C*	gal.	—	2.15
ML-1028-2C*	gal.	—	2.15
Mold Lubricant No. 72 Conc.* (dms.)	gal.	—	1.90
Mold Lubricant No. 735* (dms.)	gal.	—	1.25
No. 769* (dms.)	gal.	—	1.20
No. 825* (dms.)	gal.	—	2.00
No. 856* (dms.)	gal.	—	1.90
No. 880* (dms.)	gal.	—	1.19
No. 887* (dms.)	gal.	—	1.80
No. 896* (dms.)	gal.	—	1.28
No. 935* (dms.)	gal.	—	1.56
No. 956* (dms.)	gal.	—	2.50
No. 965* (dms.)	gal.	—	2.15
No. 967* (dms.)	gal.	—	2.40
No. 969* (dms.)	gal.	—	1.50
No. 975* (dms.)	gal.	—	2.85
No. 980* (dms.)	gal.	—	1.53
No. 987* (dms.)	gal.	—	2.45
Moldeze No. 3*	gal.	—	4.95
Mold-Brite*	gal.	—	1.50
Monopole Oil MD*	lb.	—	.16
Olate Flakes*	lb.	.22	.23
Orvus WA Paste* (dms.)	lb.	—	.22
Plaskon Polyethylene S*	lb.	.32	.47
Poly-Brite PE-20	lb.	.28	.42
600	lb.	.42	.58
Poly-Cone 125X	lb.	1.20	1.40
1,000	lb.	.93	1.06
Polyglycol 15-200*	lb.	.25	.28¾
E4000*	lb.	.31	.37
Prodag*	lb.	.28	.42
Purity Flake* (dlvd.)	lb.	.18	.19¾
Rubber-Flo*	gal.	1.25	2.00
Rubber-Glo*	gal.	—	.94
Rusco Mold Paste*	lb.	—	.25
Sericite* (l.c.l.)	ton	65.00	75.00
Silicone Oil A145*	lb.	3.18	3.61
Silrex (dms.)	lb.	—	.65
A65*	lb.	2.50	2.75
Soybean Lecithin	lb.	.13	.17
Thermalube*	lb.	—	.13¾
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-45*	lb.	1.22	1.70
LE-450*	lb.	1.22	1.70
Ucon Lubricants*	lb.	.26¾	.27¾
Ulco Mold Soap	lb.	.15	.29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	—	.25
Extrud-o-Lube*	gal.	1.33	1.54
G.B. Naphthenic Neutrals*	gal.	.11	.18
Ivory Chips*	lb.	.18¼	.19¼
Latex-Lube GR* (dlvd.)	lb.	.19¼	.20
No. 82-A* (450 lb. dms.)	lb.	—	.08½
Propylene Stearate (dms.)	lb.	.35	.60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	.46
Calcium Stearate	lb.	.39	.44
Crown Brand*	lb.	.37	.42
D.C. 7 Compound*	lb.	5.13	6.50
D.C. 200 Fluid*	lb.	3.14	4.75
ELA*	lb.	—	.82
G-E Silicone Fluid SF-92*	lb.	3.14	4.25
Glycerized Lubricant*	gal.	1.25	1.48
Glydag B*	lb.	1.50	2.10
G*	lb.	1.30	2.45

LUBRICANTS, RUBBER SURFACE (Cont'd)

Glyso-Lube* (dms.)	lb.	—	.14
No. 3* (dms.)	lb.	—	.14
HSC No. 35*	lb.	1.28	1.34
No. 515*	lb.	1.28	1.34
Hydro-Zinc*	lb.	—	.20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¼	.18¼
R-66*	lb.	—	.16½
Liqui-Lube* (dlvd.)	lb.	—	.16¼
N.F.* (dlvd.)	lb.	—	.16¾
N.T.* (dlvd.)	lb.	—	.16¾
Lubrex*	lb.	.25	.30
Lubri-Cote	gal.	.86	1.00
Magnesium Stearate Crown Brand*	lb.	.40	.45
Polyethylene Glycol	lb.	.22	.26
Rubber Free (Concentrate)*	gal.	—	1.44
Jel*	lb.	.18	.21½
Slab-Dip* (dms.)	lb.	—	.15
Soybean Lecithin	lb.	.13	.17
Stock-Lube*	lb.	—	.19
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-450*	lb.	1.22	1.70
Zinc Stearate	lb.	.41	.46

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	1.65
Alkon* (dlvd.)	lb.	.16	.16½
CA-301*	gal.	—	2.49
CA-302*	gal.	—	2.63
G-O 6910*	lb.	.38	.40
Metso Anhydrous*	cwt.	5.70	7.95
Metso 99*	cwt.	5.00	7.25
200*	cwt.	6.70	8.95
Granular*	cwt.	4.45	6.70
Orvus Extra Granules*	lb.	.22½	.23½
Rubber-Sol*	gal.	2.97	3.97
Sprex A.C.* (dlvd.)	lb.	.17¾	.18¾
Zip Mold Cleaner*	gal.	.95	1.45

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	1.25
Pepton 22 Plasticizer*	lb.	.83	.86
65*	lb.	1.23	1.26
65B*	lb.	.83	.86
Pitt-Consol 620, 640	lb.	.37	.42
RPA 2*	lb.	—	.85
3*	lb.	—	.51
3 Conc.*	lb.	—	.85
5*	lb.	—	.68
6*	lb.	—	1.66

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	—	09
Adipol BCA*	lb.	.45	.45½
2EH*	lb.	.42½	.43½
10A*	lb.	.42½	.43½
ODY*	lb.	.45½	.46½
810*	lb.	.42½	.45¼
XX*	lb.	.42½	.43½
Admex 562 (dms.)	lb.	.50¼	.51¼
710 (dms.)	lb.	.35¼	.36¼
711 (dms.)	lb.	.37¼	.38¼
744 & 745 (dms.)	lb.	.41¼	.42¼
760 (dms.)	lb.	.59¼	.60¼
761 (dms.)	lb.	.46¼	.47¼
Anhydrol 6990*	lb.	.51	.56
Arneel SD*	lb.	.34	.40
Arolene 1980* (c.l.)	lb.	—	.10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.05	.06½
Aromatic Tar	gal.	.0573	.1973
Bardol*	lb.	.02¾	.03¾
B*	lb.	.06¼	.06½
Bayol D*	gal.	—	.382
F*	gal.	—	.52
Beeswax, Bleached	lb.	.76	.79
Yellow Refined	lb.	.68	.70
Bondogen*	lb.	.55½	.60½
B.R.C. No. 20*	lb.	.0150	.0175
No. 21*	lb.	.02¾	.03
No. 22*	lb.	.02½	.02¾
B.R.H. 2*	lb.	.0213	.0351
BRS 700*	lb.	.0200	.0285
B.K.T. 3*	lb.	.0180	.0265
4*	lb.	.0250	.0269
7*	lb.	.0300	.0310
B.R.V.*	lb.	.0475	.0565
Bunarex Resins*	lb.	.07	.08
Bunatak AH*	lb.	—	.09½
N*	lb.	—	.31
U*	lb.	—	.17½
No. 90*	lb.	—	.09
No. 210*	lb.	—	.14
Butac*	lb.	.12½	.13½
Butyl Carbitol Perlargonate (dms.)	lb.	—	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	—	.68
Butyl Oleate	lb.	.25½	.26½
Butyl Palmitate	lb.	—	.26½
Butyl Stearate (dms.)	lb.	.25¼	.27¼
Cabflex DDA*	lb.	.40	.43½
DDP*	lb.	.29½	.33
Di-BA*	lb.	.41	.44½
Di-OA*	lb.	.40	.43½
Di-OP*	lb.	.28½	.32
Di-OZ*	lb.	.45½	.49
DOA*	lb.	.40	.43½
DOP*	lb.	.28½	.32
HS-10	lb.	.44	.47½
ODA*	lb.	.40	.43½
ODP*	lb.	.29	.32½
TCP*	lb.	.34½	.38

SAVE TIME
SAVE MONEY
with INDEPENDENT and NEW ERA DIES

CLICKER-WALKER
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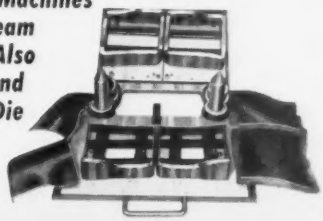
MAUL HANDLE

Dies For Every Conceivable Purpose

DISTRIBUTORS FOR:

Fales Clicker Machines and Seelye Beam Die Presses. Also Hard Maple and Composition Die Blocks and Pads. Raw Hide Mauls.



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. . . it costs no more for *"tailored to the job"* PRESSES
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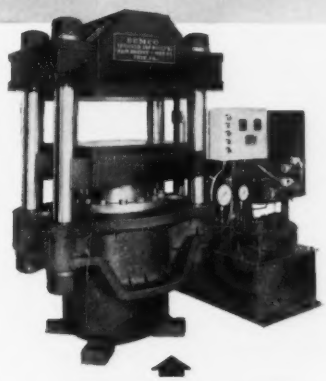
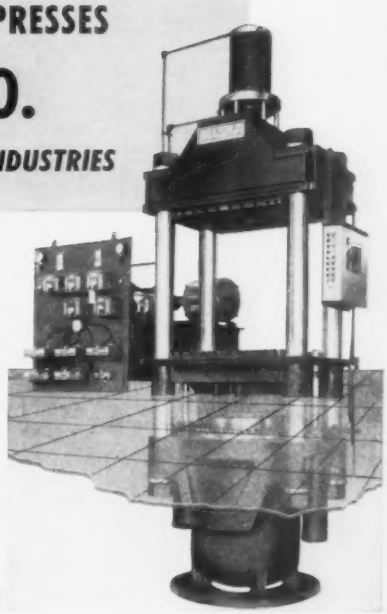
for RUBBER • PLASTICS • FIBERGLASS • WOOD PRODUCTS INDUSTRIES



COMPRESSION MOLDING PRESS

EEMCO offers a complete line of heavy duty hydraulic presses for compression or transfer molding, laminating and polishing. Manufactured in all sizes, from small laboratory presses up to the largest, to suit any requirements. Also, complete installations for reinforced plastics molding. Investigate the EEMCO line, before you buy. Send us your requirements, regardless of size or capacity required. It costs no more to have EEMCO design and build presses to meet your particular requirements.



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EEMCO ERIE ENGINE & MFG. CO.
950 East 12th Street, Erie, Pa.

Designers and builders of a complete line of Mills and Hydraulic Presses for the RUBBER, PLASTICS, FIBERGLASS and WOOD PRODUCTS INDUSTRIES.

PLASTICIZERS & SOFTENERS (Cont'd)

Califlux 510* (and 550*)	lb.	.03½	- .03¾
G.P.*	lb.	.02¼	- .02½
R-100*	lb.	.05½	- .05¾
TT*	lb.	.0270	- .0295
Candelilla Wax, Prime	lb.	.70	- .74
Refined Light	lb.	.73	- .78
Carbowax 4000* (dms.)	lb.	.31	- .32
Carnauba Wax, Crude	lb.	.71	- .77
Flaked	lb.	.72	- 1.55
Refined, Technical	lb.	.72	- .80
Refined, Pure	lb.	.80	- .86
Yellow	lb.	1.42	- 1.45
Celluflex* (dms.)			
112* (t.c., dlvd.)	lb.	——	- .34½
179-A* (t.c., dlvd.)	lb.	——	- .32½
179-C* (t.c., dlvd.)	lb.	——	- .32½
179-EG* (t.c., dlvd.)	lb.	——	- .32½
DBP* (t.c., dlvd.)	lb.	——	- .30
DOP* (t.c., dlvd.)	lb.	——	- .28½
TPP* (dms., eqld.)	lb.	——	- .40
Ceresin Wax	lb.	.12	- .30
Chlorowax 40*	lb.	.15¼	- .17¼
50*	lb.	.16¾	- .17¾
70*	lb.	.18½	- .20
LV*	lb.	.17¼	- .19¼
CTLA Polymer*	gal.	.20	- .36
Cumar Resins*	lb.	.07	- .19
Darex DBI*	lb.	.30	- .33
DOP*	lb.	.30½	- .33½
DIOP*	lb.	.30½	- .33½
D.B.M.*	lb.	.32	- .34¼
Decylbutyl Phthalate	lb.	.27	- .29½
Degras, Common	lb.	——	- .14
Diallyl Phthalate	lb.	.51½	- .52½
Dibenzyl Sebacate	lb.	.88	- .89½
Dibutoxyethyl Sebacate	lb.	——	- .56¼
Dibutyl Phthalate	lb.	.32½	- .33½
Dibutyl Sebacate	lb.	.64½	- .66
Dicapryl Adipate	lb.	.42	- .44
Dicapryl Phthalate	lb.	.29½	- .31
Dicapryl Sebacate	lb.	.58	- .59½
Di-CarbitolPhthalate(dms.)	lb.	.49	- .49½
Dicyclohexyl Phthalate	lb.	.58¼	- .59¼
Diethyl Phthalate	lb.	.31½	- .32½
Di-2-ethylhexyl Phthalate	lb.	——	- .30½
Dihexyl Adipate	lb.	.40	- .42½
Dihexyl Phthalate	lb.	.30	- .32½
Dihexyl Sebacate	lb.	.65	- .74
Diisobutyl Azelate	lb.	——	- .47¼
Di-iso-octyl Adipate	lb.	.40	- .43½
Di-iso-octyl Phthalate (t.c.)	lb.	.28	- .31½
Dimethyl Phthalate	lb.	.32	- .33
Dimethyl Sebacate	lb.	1.30	- 1.32
Dinonyl Adipate	lb.	.44½	- .47½
Dinopol 235*	lb.	.36	- .37
IDO*	lb.	.31	- .32
MOP*	lb.	.31½	- .32½
Dioctyl Adipate	lb.	.40	- .42½
Dioctyl Phthalate (dms.)	lb.	.28	- .31½
Dioctyl Sebacate (dms.)	lb.	.60	- .63
D.I.O.P. (dms.)	lb.	.31	- .32
Dipolymer Oil	gal.	.33	- .48
Dispersing Oil No. 10*	lb.	.06	- .06¼
Dutrex 6*	gal.	——	- .11
15E*	gal.	——	- .10
Elastex 10-P*	lb.	.30½	- .33½
50-B*	lb.	.25	- .28
DCHP*	lb.	.59	- .60
Emulphor EL-719*	lb.	——	- .58
Epoxy Plasticizer	lb.	.33½	- .36
Drapex 3.2*	lb.	.39¼	- .44
Drapex 4.4*	lb.	.37	- .42
Esparto Wax	lb.	——	- .55
Estac*	lb.	——	- .16
Facile Gum 4A*	lb.	.48	- .50
Flexol B-400*	lb.	.27½	- .28½
DOP*	lb.	.33	- .34
TOF*	lb.	.45½	- .46½
3GH*	lb.	.46	- .46¾
3GO*	lb.	.55	- .55¾
4GO*	lb.	.35	- .36
426*	lb.	.29½	- .30½
Flexricin P-1*	lb.	——	- .32
P-4*	lb.	——	- .34¾
P-6*	lb.	——	- .41½
P-8*	lb.	——	- .34¾
Fortex A* (dms.)	lb.	.12½	- .14½
Galex W-100*	lb.	.15½	- .19¼
G.B. Asphaltic Flux*	gal.	.23	- .25
G.B. Light Process Oil*	lb.	.0157	- .0177
Medium Process Oil*	lb.	.03½	- .03¾
G.B. Naphthenic Neutrals*	lb.	.04½	- .04¾
Good-rite GP233*	lb.	.40	- .43½
GP235*	lb.	.40	- .43½
GP236*	lb.	.40	- .43½
GP261*	lb.	.28	- .31½
GP265*	lb.	.28½	- .32
GP266*	lb.	.29	- .32½
GP-266-BPA*	lb.	.29	- .32½
Harflex 500* (dms.)	lb.	.31½	- .34
HB20*	lb.	.15	- .17
HB40*	lb.	.19	- .22
Herron-H.T.*	gal.	.16	- .27
Herron-Plas*	lb.	——	- .03¼
Herron-Wax*	lb.	.05¼	- .06
No. 23*	lb.	.08¼	- .08¾
No. 24*	lb.	.07¼	- .07¾
HSC No. 13*	lb.	.25	- .32
No. 28 and 38*	lb.	.20	- .27
Indonex 632½* (633½*, 634½*, 637½*)	gal.	.12	- .19
Isooctyl Decyl Phthalate	lb.	.28½	- .32
Kapsol*	lb.	.35	- .35½
Kenflex*	lb.	.18	- .27

PLASTICIZERS & SOFTENERS (Cont'd)

Kesscoflex 101* (dms.)	lb.	——	- .37½
103* (dms.)	lb.	——	- .38
MCO* (dms.)	lb.	——	- .35½
BCL* (dms.)	lb.	——	- .37½
MCP* (dms.)	lb.	——	- .41
BCP* (dms.)	lb.	——	- .36
KP 23*	lb.	.31½	- .32½
90*	lb.	.42½	- .43½
140*	lb.	.48	- .48½
201*	lb.	.58	- .59
220* & 260*	lb.	.35½	- .36½
666*	lb.	.59½	- .60
Kremol 40*	gal.	.36	- .46
50*	gal.	.39	- .49
Kronisol* (dms.)	lb.	.33	- .36
Kronitex AA* (dms.)	lb.	.35	- .36
I* (dms.)	lb.	.35	- .36
K-3*	lb.	.35	- .36
MX*	lb.	.35	- .36
Lanolin, Tech. Anhydrous	lb.	——	- .20
Latex-Lube G.R.*	lb.	.19¼	- .20
Lead Oleate	lb.	——	- .29¾
Lindol* (dms., t.c.)	lb.	——	- .32½
Locusol No. 1-6980*	lb.	.30	- .34
2-Mercaptoethanol (dms.)	lb.	1.25	- 1.50
Methox*	lb.	.40½	- .41
Methyl Laurate	lb.	.25	- .27
Methyl Oleate	lb.	——	- .20
Methyl Stearate (dms.)	lb.	——	- .30
Monoplex DOS*	lb.	.59½	- .60½
DBS*	lb.	.65½	- .66½
S-70*	lb.	.41	- .42
S-71*	lb.	.46½	- .47½
Montan Wax, Crude	lb.	.26	- .35
Flaked	lb.	.29	- .40
Morflex*	lb.	.32	- .69½
MR 2088* (dms.)	lb.	——	- .19
Natac*	lb.	.12	- .13
Nebony Resins* (dms.)	lb.	.04½	- .05
Neolene 210* (t.c.)	lb.	——	- .16
212* (t.c.)	lb.	——	- .14
220* (t.c.)	lb.	——	- .15
Nerium*	lb.	——	- .09
Nevillac Resins* (dms.)	lb.	.31	- .85
Neville LX-880* (dms.)	lb.	.12	- .13½
LX-685* (dms.)	lb.	.12½	- .17½
Neville Resins* (dms.)	lb.	.07¼	- .20
Nevindene Resins* (dms.)	lb.	.16½	- .20
Nevinol* (dms.)	lb.	——	- .24
Nuba 1* (and 2*) (dms.)	lb.	.06¼	- .06¾
No. 480 Oil Proof Resin*	lb.	——	- .18
Olopex Q10* (dms.)	lb.	.30½	- .31½
R9* (dms.)	lb.	.37¼	- .37¾
Ortho-Nitrobiphenyl	lb.	.13	- .15
Ozokerite Wax, White and Yellow	lb.	.24	- .31
Paradene Resins (dms.)	lb.	.07¼	- .08
No. 2 Flaked	lb.	.08	- .08½
Para Flux* (dms.)	gal.	.22	- .25
2016* (dms.)	gal.	.22	- .26
Para Lube* (t.c.l.)	lb.	.046	- .048
Paraplex G-25*	lb.	.76	- .77
G-40*	lb.	.50	- .51
G-50*	lb.	.40¾	- .41¾
G-53*	lb.	.45	- .46
G-60* (and G-61*)	lb.	.35	- .36
G-62*	lb.	.37	- .38
Parmo*	lb.	.06	- .13½
Pepton 22 Plasticizer*	lb.	.81	- .84
PG-16*	lb.	——	- .35
Philrich-5* (t.c.)	gal.	——	- .11
Picco 10* (and 25*)	lb.	.15	- .17
60* (and 75*)	lb.	.15	- .17
100*	lb.	.15	- .17
Piccocizer 30*	lb.	.05½	- .07
Piccolastic A* (B*, C*, D* & E*)	lb.	.28	- .29
FT* (FHF* & FX*)	lb.	.1815	- .1965
T-135*	lb.	.23¾	- .23¾
Piccolyte S Resins*	lb.	.20½	- .22¾
Piccopale Resins*	lb.	.12	- .13
Piccoumaron Resins*	lb.	.07	- .24½
Pigmentar*	lb.	.0460	- .0634
Pigmentaroil*	lb.	.0460	- .0634
Plastac M*	lb.	——	- .09¼
Plasticizer 2286*	lb.	——	- .26¼
Plasticizer 4141*	lb.	.42½	- .43½
Plasticizer DP-200, DP-250, DP-520*	lb.	.42¼	- .46¼
Plasticizer LP*	lb.	——	- .07
Plasticizer MP*	lb.	——	- .08
Plasticizer MT-511*	lb.	——	- .68¾
Plasticizer ODN*	lb.	.35	- .41
Plasticizer SC*	lb.	.42½	- .43½
Plasticizer W-13*	lb.	.37	- .38¾
Plastoflex 3*	lb.	——	- .52
52*	lb.	.37¾	- .38¾
VS*	lb.	.41¾	- .42¾
Plastogen*	lb.	.08¾	- .09
Plastolein 9050* (c.l.)	lb.	.54½	- .56½
9055*	lb.	.30½	- .32½
9058*	lb.	.48	- .50
9250*	lb.	.38¼	- .40¼
9715*	lb.	.39	- .40
Plastone	lb.	.23	- .27
Polycizer 162*	lb.	.28	- .31½
332*	lb.	.40	- .42½
562*	lb.	.28½	- .32
662*	lb.	.29	- .32½
532 and 632*	lb.	.40	- .42½
ED*	lb.	——	- .51
Polyco 438*	lb.	.34	- .35
Polymel C-130*	lb.	.13¾	- .14¾
D*	lb.	.22½	- .23½
6*	lb.	.05¾	- .07¼
Poly-Sperse AP-2	lb.	.23	- .29½
AP-300, LC-20	lb.	.26	- .32½

PLASTICIZERS & SOFTENERS (Cont'd)

Poly-Sperse R-100	lb.	.17	- .23½
Process Oil C-255* (c.l.)	gal.	.27½	- .29½
Propylene Stearate (dms.)	lb.	——	- .32
PRR 1*	gal.	.15	- .35
PT 67 Light Pine Oil* (dms.)	gal.	——	- .60
101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	- .0634
400 Pine Tar* (600* & 800*) (t.c., dms.)	lb.	.0460	- .0634
PX-104*	lb.	.30	- .32½
PX-108*	lb.	.30½	- .33
PX-138*	lb.	.32½	- .33½
PX-208*	lb.	.44½	- .45½
PX-238*	lb.	.44½	- .45½
PX-404*	lb.	.66	- .67
PX-438*	lb.	.60	- .61
PX-800*	lb.	.34	- .35
PX-917*	lb.	.36½	- .37½
Reogen*	lb.	.14¼	- .14½
465 Resin* (dms.)	lb.	.07½	- .08
Resin C*	lb.	.0225	- .0310
Resinex*	lb.	.03¼	- .04¾
L-4*	lb.	.02¼	- .03¼
Rexflex*	lb.	——	- .15
Rosin Oil	gal.	.80	- 1.35
RR-10 (Neoprene)*	lb.	——	- .37
R.S.O. Softening Oil*	lb.	.03	- .05
RuBars*	lb.	.19¼	- .20
Rubberol*	lb.	.18	- .25¾
Santicizer B-16*	lb.	.48¾	- .49¾
E-15*	lb.	.52¾	- .53¾
M-17*	lb.	.44¾	- .45¾
No. 140*	lb.	.32½	- .36
No. 141*	lb.	.36	- .37
No. 160*	lb.	.28½	- .29¼
No. 602*	lb.	——	- .30½
No. 603*	lb.	——	- .27
Sherolatum*	lb.	.03½	- .06
Staflex DBES*	lb.	.58	- .60¼
DOS*	lb.	.58	- .60½
IXA*	lb.	.32	- .35
KA*	lb.	.36	- .38¾
Stan Chlor Oils*	lb.	.13½	- .20½
70*	lb.	.17½	- .30
Stanolind Petrolatum*	lb.	.07	- .156
Wax*	lb.	.31	- .33
Sunny South Burgundy Pitch*	lb.	.1030	- .1085
Rosin Oil*	gal.	.58	- .76
Superla Wax*	lb.	.30	- .397
Syncera Wax*	lb.	.16	- .267
Syn Tac* (c.l.)	gal.	——	- .33
Synthetic Revertant Oil	lb.	——	- .16
Tar, Refined	gal.	.1200	- .1760
Tarpine	lb.	.035	- .050
Terpene A*	gal.	——	- .65
Tetraflex R-122*	lb.	.27	- .30½
TP-90B*	lb.	.59	- .69
TP-95*	lb.	.65	- .75
Transphalt Resins*	lb.	.03¾	- .05¼
Tributyl Phosphate	lb.	.52½	- .53½
Tricresyl Phosphate	lb.	.32½	- .36
Turgum S*	lb.	.10¾	- .11¾
Vanadiset B*	lb.	.036	- .07
C*	lb.	.031	- .06
MR 80 Mesh*	lb.	.08½	- .12¼
Vistac No. 1*	gal.	1.00	- 1.21
P*	lb.	.18	- .18½
Vopcolene 50*	lb.	——	- .31
Witcizer 100*	lb.	.20¼	- .21¼
200*	lb.	.20¼	- .21¼
201*	lb.	.22¾	- .25¼
300*	lb.	.30	- .33½
312*	lb.	.30½	- .34
313*	lb.	.30½	- .34
412*	lb.	.42½	- .46
Witresin*	ton	——	- 52.50

PROCESSING AIDS

Castor Oil, Blown (dms.)	lb.	——	- .21
Refined (dms.)	lb.	——	- .18½
Castorwax*	lb.	——	- .24½
Dutrex 7*	lb.	.12	- .20
ELA*	lb.	——	- .82
Hydrofol Glycerides 200*	lb.	.15½	- .19¼
Kenflex N*	lb.	——	- .18
Maleic Anhydride	lb.	——	- .27
Millrex*	lb.	——	- .15
Nadic Anhydride	lb.	——	- .75
Polycin*	lb.	——	- .24½
Resin No. 510*	lb.	.19	- .26
No. 529*	lb.	.25	- .32
Pulverized*	lb.	.20½	- .25
Thiomalic Acid	lb.	——	- 3.50
Zyrox*	lb.	.78	- .88

PROTECTIVE & STABILIZING AGENTS

Acacia*	lb.	.12¾	- .21
Alcogum*	lb.	.08½	- .24
Alpha Protein	lb.	——	- .23
Aroostocrat*	lb.	——	- .07½
Carob Bean Flour	lb.	——	- .50
Casein	lb.	.32	- .38
Emcol K-8300* (dms.)	lb.	.14	- .18
Ethylene Diamine 68%	lb.	.44	- .47
Gum Arabic	lb.	——	- .23
Karaya Gum	lb.	——	- .35
Locust Bean Gum	lb.	——	- .50
Prosein*	lb.	——	- .06
Stablex B*	lb.	.50	- .95
K*	lb.	.27	- .35

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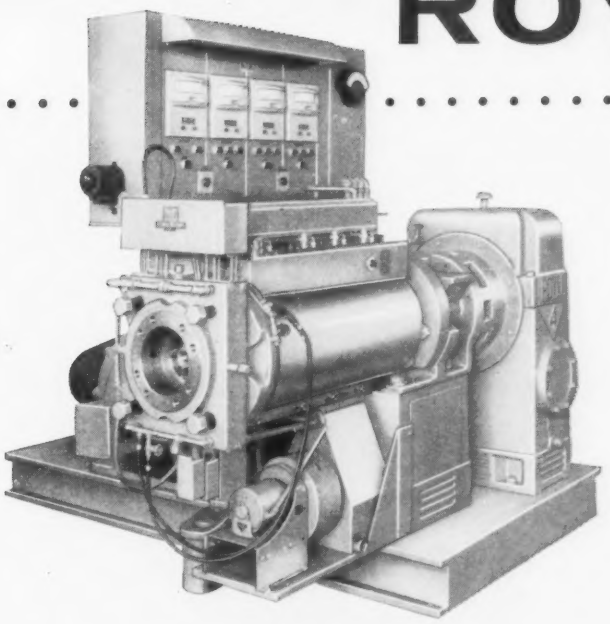

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Amalgamator Z-4*	lb.	.32	- .33
Armeen C*	lb.	.46	- .52
Mixed Crude*	lb.	.19	- .25
T*	lb.	.32	- .38
Burco RA*	lb.	.05½	- .081
BWH-1*	gal.	.17	- .18
C-6 Oil* (28° & 32°)	gal.	.33	- .38
C-10 Oil*	gal.	.25	- .30
C-33* (t.c.)	gal.	——	- .21½
C-42* (t.c.)	gal.	——	- .23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	——	- 4.50
Liquid 50% (t.c.)	cwt.	——	- 2.80
Solid 76% (c.l., dms.)	cwt.	——	- 4.10
Cresylic Acid (99-100%)	gal.	.85	- 1.39
D-4* (t.c.)	gal.	——	- .27
E-5* (t.c.)	gal.	——	- .25
Flake Calcium Chloride (77-80%)	ton	——	- 29.00
G.B. Reclaiming Oil*	gal.	.19½	- .21½
CD-10*	gal.	.17½	- .19½
CD-50-U*	gal.	.25½	- .27½
Gensol No. 6* (t.c.)	gal.	——	- .40
Heavy Aromatic Naphtha	gal.	.13¼	- .18½
LX-77 Reclaiming Solvent*	gal.	.21	- .33
LX-572 Reclaiming Oil*	gal.	.27	- .32
LX-777 Reclaiming Oil*	gal.	.23	- .33
Neo-Fat D-242*	lb.	.05½	- .07¾
42-70*	lb.	.08¼	- .10¼
No. 517 H.B. Oil*	gal.	.11½	- .16½
535*	gal.	.22	- .27
Pitt-Consol "500" (dms.)	lb.	.30	- .30½
PT 67 Light Pine Oil* (dms.)	gal.	——	- .60
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0460	- .0634
PT 150 Pine Solvents* (dms.)	gal.	——	- .44
Q Oil* (t.c.)	gal.	——	- .286
Reclaiming Oil 3186-G*	gal.	.26	- .33
Reclaiming Reagent No. 1431*	lb.	.21	- .25
R.P.A. No. 3*	lb.	——	- .47
RR-10*	lb.	——	- .37
Soda Ash (c.l., bags)	cwt.	——	- 1.75
Solvent 534*	gal.	.20½	- .26½
Solvent Oil 21*	gal.	.24	- .29
C-42*	gal.	.23	- .38
X-1 Resinous Oil*	lb.	.0225	- .0325
701 Oil*	gal.	.27	- .29

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0775	- .1450
Continental F*	lb.	.0775	- .1450
Croflex*	lb.	.0775	- .1450
Dixiedensed (and S)*	lb.	.0775	- .1450
Kosmobile (and S)*	lb.	.0775	- .1450
Micronex HPC*	lb.	.0775	- .1450
Witco No. 6*	lb.	.0775	- .1450

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0775	- .1350
Atlantic MPC-95*	lb.	.0775	- .1450
Continental A*	lb.	.0775	- .1450
Croflex TH*	lb.	.0775	- .1450
Dixiedensed HR (and S-66)	lb.	.0775	- .1450
Kosmobile HM (and S-66)	lb.	.0775	- .1450
Micronex Standard*	lb.	.0775	- .1450
Spheron 6*	lb.	.0775	- .1450
Texas M*	lb.	.0775	- .1450
Witco No. 1*	lb.	.0775	- .1450

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0775	- .1450
Collocarb*	lb.	.0590	- .1400
Continental AA*	lb.	.0775	- .1450
Croflex 77*	lb.	.0775	- .1450
Dixiedensed 77*	lb.	.0775	- .1450
Kosmobile 77*	lb.	.0775	- .1450
Micronex W-6*	lb.	.0775	- .1450
Spheron 9*	lb.	.0775	- .1450
Texas E*	lb.	.0775	- .1450
Witco No. 12*	lb.	.0775	- .1450
Wyex EPC*	lb.	.0775	- .1350

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2600	- .3400
Dixie 5 Dustless*	lb.	.1350	- .2100
Dixie Voltex*	lb.	.2600	- .3400
Kosmink Dustless*	lb.	.1350	- .2100
Kosmos Voltex*	lb.	.2600	- .3400
Spheron C*	lb.	.1800	- .2400
Voltex*	lb.	.2600	- .3400

Channel, Surface Treated (STC) (bags)

Texas 109*	lb.	.0840	- .1475

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0875	- .1450
Atlantic CF*	lb.	.0875	- .1450
Continex CF*	lb.	.1050	- .1550
Croflex CF*	lb.	.0875	- .1450
Dixie CF*	lb.	.0875	- .1450
Kosmos CF*	lb.	.0875	- .1450
Shawinigan Acetylene Black*	lb.	——	- .1900
Vulcan C*	lb.	.1100	- .1750

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Extra-Conductive Furnace Black (ECF) (bags)

Vulcan XC-72	lb.	.1775	- .2700

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0675	- .1250
Continex FEF*	lb.	.0675	- .1250
Croflex 50*	lb.	.0675	- .1250
Dixie 50*	lb.	.0675	- .1250
Kosmos 50*	lb.	.0675	- .1250
Philblack A*	lb.	.0675	- .1200
Statex M*	lb.	.0675	- .1250
Sterling SO*	lb.	.0675	- .1250

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0725	- .1300
Sterling 99*	lb.	.0725	- .1300

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0600	- .1175
Dixie 35*	lb.	.0600	- .1175
Kosmos 35*	lb.	.0600	- .1175
Statex G*	lb.	.0600	- .1175
Sterling V*	lb.	.0600	- .1175
V (Non-Staining)	lb.	.0600	- .1175

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0775	- .1350
Continex HAF*	lb.	.0775	- .1350
Croflex 60*	lb.	.0775	- .1350
Dixie 60*	lb.	.0775	- .1350
Kosmos 60*	lb.	.0775	- .1350
Philblack O*	lb.	.0775	- .1300
Statex R*	lb.	.0775	- .1350
Vulcan 3*	lb.	.0775	- .1350

Furnace, High Modulus (HMF) (bags)

Continex HMF*	lb.	.0675	- .1200
Croflex 40*	lb.	.0675	- .1250
Dixie 40*	lb.	.0675	- .1250
Kosmos 40*	lb.	.0675	- .1250
Modulex HMF*	lb.	.0625	- .1200
Statex 93*	lb.	.0625	- .1200
930*	lb.	.0675	- .1200
Sterling L*	lb.	.0675	- .1200
LL*	lb.	.0675	- .1200

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF*	lb.	.0575	- .1150
Croflex 20*	lb.	.0575	- .1150
Dixie 20*	lb.	.0575	- .1150
Essex SRF*	lb.	.0575	- .1150
Furnex*	lb.	.0575	- .1150
Gastex*	lb.	.0525	- .1200
Kosmos 20*	lb.	.0575	- .1150
Pelletex*	lb.	.0525	- .1100
NS*	lb.	.0525	- .1100
Shawinigan Acetylene Black*	lb.	——	- .1900
Sterling NS*	lb.	.0575	- .1150
R*	lb.	.0625	- .1250
S*	lb.	.0575	- .1150

Furnace Super Abrasion (SAF) (bags)

Dixie 85	lb.	.1150	- .1650
Kosmos 85	lb.	.1150	- .1650
Philblack E*	lb.	.1150	- .1550
Statex 160*	lb.	.1150	- .1800
Vulcan 9*	lb.	.1150	- .1800

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0925	- .1500
Continex ISAF*	lb.	.0925	- .1500
Dixie 70*	lb.	.0925	- .1500
Kosmos 70*	lb.	.0925	- .1500
Philblack I*	lb.	.0925	- .1450
Statex 125*	lb.	.0925	- .1500
Vulcan 6*	lb.	.0925	- .1500

Furnace, Super Conductive (SCF) (bags)

Vulcan SC*	lb.	.1800	- .245

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	——	- .0575
Sterling FT (c.l.)*	lb.	——	- .0575

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	——	- .0250
Sterling MT (c.l.)*	lb.	——	- .0400
MT Non-Staining (c.l.)*	lb.	——	- .0500
Thermax (c.l.)*	lb.	——	- .0400
Stainless (c.l.)	lb.	——	- .0500

REINFORCING AGENTS—SILICA

Cab-O-Sil (compressed)*	lb.	.68	- .75
Cab-O-Sil (uncompressed)*	lb.	.68	- .75
D. C. Silica (pelletized)*	lb.	1.45	- 1.65
Hi-Sil 233*	lb.	.08	- .09½
X303*	lb.	.40	- .45
Santocel*	lb.	.62	- .64
Valron Estersil*	lb.	2.00	- 2.25

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	.50	- .60
Darex Copolymer No. 3*	lb.	.47	- .49
43G*	lb.	.39	- .41
Darex Copolymer Latex No. 3-L	lb.	.41½	- .46
Durez 12687 (and 12707)*	lb.	——	- .38½
Durez 13355*	lb.	——	- .30
Good-rite Resin 2007*	lb.	——	- .41
Hystron*	lb.	.39	- .41
Kralac A-EP*	lb.	.39	- .41
Lampblack	lb.	——	- .12
Marbon S and S-1*	lb.	.39	- .41
8000*	lb.	.39	- .41
Marmix*	lb.	.39	- .41
Pliolite Latex 150*	lb.	.35	- .39
Pliolite Resin-Rubber Masterbatches*	lb.	.33	- .57
Pliolite NR*	lb.	.93	- .95
S6B*	lb.	.36	- .43
Plio-Tuf G85C*	lb.	.52	- .54
Polyco 220*	lb.	.18¼	- .19¼
Polypol S-70*	lb.	.22	- .23

RETARDERS

Benzoic Acid TBAO-2*	lb.	——	- .44
Dutch Boy Normasal*	lb.	——	- .46
ESEN*	lb.	.35	- .37
Good-rite Vultrol*	lb.	.62	- .64
Harcopol 1183*	lb.	.70	- .74
Retarder J*	lb.	.62	- .64
PD*	lb.	.37	- .39
W*	lb.	——	- .42
Retardex*	lb.	.49	- .49
Wiltrol P	lb.	.37	- .39

RUBBER SUBSTITUTES

Mineral Rubber

Byerlyte*	ton	50.00	- 57.00
Hard Hydrocarbon (dms.)*	ton	53.00	- 55.00
Herron Flake*	ton	——	- 45.00
Mineral Rubber, Solid	ton	42.50	- 44.50
M. R. No. 38*	ton	55.00	- 65.00
Witresin	ton	——	- 52.50

Vulcanized Vegetable Oils

Amberex*	lb.	.29	- .36
Brown	lb.	.15	- .24
Car-Bel-Lite*	lb.	.3000	- .3300
Neophax*	lb.	.17	- .27
Polyrez A and C*	lb.	.12	- .17
White	lb.	.15	- .26

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06	- .06½
Gilsowax B*	lb.	.09	- .11
Resin No. 1098 (dms.)	lb.	——	- .62
No. 1198*	lb.	.46¾	- .49¾
Tysonite*	lb.	.26	- .26¾

SOLVENTS

Acetone (dlvd.)	lb.	.11	- .12
Amsco Lactol Spirits* (t.c.)	gal.	——	- .19
Naphthol Spirits*	gal.	——	- .18
Mineral Spirits*	gal.	——	- .17
Rubber Solvent* (t.c.)	gal.	——	- .18
Solv A* (t.c.)	gal.	——	- .24½
Solv A-80* (t.c.)	gal.	——	- .30
Solv B* (t.c.)	gal.	——	- .28½
Solv B-90* (t.c.)	gal.	——	- .32
Solv D* (t.c.)	gal.	——	- .30
Solv E*	gal.	——	- .30
Solv F*	gal.	——	- .30
Solv F-80*	gal.	——	- .32½
Solv G*	gal.	——	- .42½
Special Naphtholite* (t.c.)	gal.	——	- .18
Special Textile Spirits*	gal.	——	- .19
Super Hi-Flash Naphtha*	gal.	——	- .35
Super Naphtholite*	gal.	——	- .18
Textile Spirits* (t.c.)	gal.	——	- .19
Amyl Chlorides, Mixed (t.c.l.) (dms.)	lb.	——	- .11
Benzol 90%	gal.	.36	- .40
Butyl Acetate (t.c.)	lb.	——	- .13½
Butyl Alcohol (t.c.)	lb.	——	- .11½
Secondary (dlvd.)	lb.	.15	- .16
Tertiary (dlvd.)	lb.	.15	- .16
Carbon Bisulfide, Tech.	lb.	.0545	- .0161

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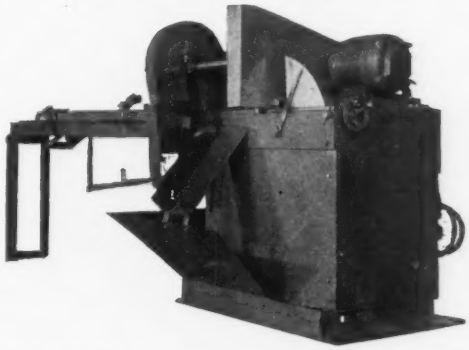

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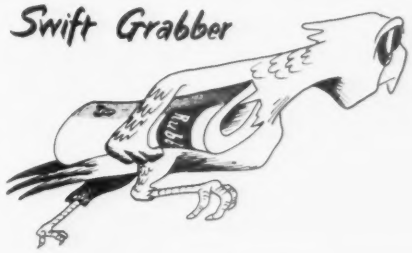

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SOLVENTS (Cont'd)

Carbon Tetrachloride	lb.	.10	.13½
Cosol 1*	gal.	.37	.43
2*	gal.	.42	.48
Cyclohexane	gal.	.55	.72
85% (c.l.) (dms.)	gal.	—	.56
Cyclohexanone	lb.	.29	.31½
Diacetone, Pure (dlvd.)	lb.	.15½	.16½
Dichlorethyl Ether (dms.)	lb.	.14½	.15
Formal (dms.)	lb.	.30¾	.31¼
Dichoropentanes (l.c.l.) (dms.)	lb.	—	.06
Dicom*	gal.	—	.50
Halowax Oil*	lb.	.28	.41
Heptanes* (t.c.)	gal.	.19	.22
Hexanes (t.c.)	gal.	.19	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.57	.64
Ether, Ref. (dlvd.)	lb.	.09½	.10½
Mersol*	gal.	.43	.75
Mesityl Oxide (dlvd.)	lb.	.15	.16
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.57	.63
Methyl Chloride	lb.	—	.11½
Methyl Ethyl Ketone	lb.	.15	.16
Methyl Isobutyl Ketone (dlvd.)	lb.	.17	.18
Methylene Chloride	lb.	.11¾	.16
N-5 Pentane Mix* (t.c.)	gal.	—	.13½
N-6 Hexanes* (t.c.)	gal.	—	.14½
N-7 Hexanes* (t.c.)	gal.	—	.13½
Penetrell*	gal.	.42	.63
Perchlorethylene	lb.	.11½	.14½
Petrolene* (t.c.)	gal.	—	.14125
Picolines, Alpha, Refined	lb.	.43½	.44
Mixed	lb.	.32½	.33
Proprietary Solvent (dms.)	gal.	.66	.77
Propyl Acetate (t.c., dlvd.)	lb.	—	.11¾
Alcohol (t.c., dlvd.)	lb.	—	.11
PT 150 Pine Solvent* (dms.)	gal.	—	.44
Pyridine, Refined	lb.	.74½	.75
Quinoline	lb.	.50	.54¼
Rubber Solvent (t.c.)	gal.	—	.16
Rubsol (t.c.)	gal.	—	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	—	.158
C (Heptanes)* (t.c.)	gal.	—	.151
R (Rubber Solvent)*	gal.	—	1.29
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100* (t.c.)	gal.	.33	.35
150 (t.c.)	gal.	.33	—
Sunny South DD Dipentine*	gal.	.42	.63
Sunny South DD Pine Oil*	lb.	—	.15
Sunray*	gal.	.1140	.1600
Toluene (dms.)	gal.	—	.38
Toluol (t.c.)	gal.	.33	.35
Trichlorethane	lb.	.13	.13½
Triglycol Dichloride	lb.	.63	.64
Union Thinner 1* (t.c.)	gal.	—	.174
5* (dms.)	gal.	—	.199
7* (t.c.)	gal.	—	.164
2-50 W Hi-Flash*	gal.	—	.41
Xylol	gal.	.34	.38

STABILIZING AGENTS (for Vinyl Resins)

Advastab BC-12*	lb.	.90	.95
BC-74*	lb.	.70	.75
BC-105*	lb.	.75	.80
CH-101*	lb.	.60	.65
CH-201*	lb.	.60	.65
E-82*	lb.	.90	.95
ICX*	lb.	.62	.67
L Paste*	lb.	.65	.70
SN*	lb.	.47	.52
T-10*	lb.	1.90	1.95
T-50-LT*	lb.	3.20	3.25
XBZ-155*	lb.	.69	.74
XC-143*	lb.	.90	.95
XE-98*	lb.	.53	.58
Barca 10*	lb.	.75	.80
Barium Ricinoleate (BVS)	lb.	—	.70
Barium Stearate	lb.	.39	.44
Basic Silicate White Lead	lb.	.16	.17
Cadmium Ricinoleate	lb.	—	2.00
Calcium Ricinoleate	lb.	—	.55
Dutch Boy DS-207*	lb.	—	.54
Plumb-O-Sil A*	lb.	—	.29¼
B*	lb.	—	.31¼
Tribase*	lb.	—	.26½
Dythal*	lb.	—	.39½
Ferro 182* (dms.)	lb.	.70	.76
200* (dms.)	lb.	1.33	1.43
203* (dms.)	lb.	.87	.91
541* (dms.)	lb.	.35½	.45½
541A* (dms.)	lb.	.82	.86
700* (dms.)	lb.	.48¾	.58¾
900* (dms.)	lb.	.90	.94
903* (dms.)	lb.	.60	.64
909* (dms.)	lb.	.91	.95
920*	lb.	—	.98
931* (dms.)	lb.	.75¾	.85¾
993* (dms.)	lb.	.89	.99
1203* (dms.)	lb.	1.30	1.40
1206* (dms.)	lb.	1.32	1.36
1820* (dms.)	lb.	.90	.94
1825* (dms.)	lb.	1.00	1.04
1976*	lb.	.47	.51

STABILIZING AGENTS (Cont'd)

Harshaw 1-V-3*	lb.	.43	.45
1-V-4*	lb.	.66½	.70
1-V-7*	lb.	.66	.68
2-V-4*	lb.	.85	.87
2-V-7*	lb.	—	1.10
2-V-8*	lb.	—	1.30
5-V-1*	lb.	.41	.43
7-V-1*	lb.	—	.90
8-V-1*	lb.	.88	.90
8-V-5*	lb.	—	.80
8-V-100*	lb.	.82	.84
9-V-1*	lb.	.70	.72
12-V-5*	lb.	.73	.75
24-V-1*	lb.	1.10	1.12
28-V-2*	lb.	—	1.18
128-V-5*	lb.	.86	.88
Lithium Stearate	lb.	.52	.57
Fluffy	lb.	.47½	.70
Standard	lb.	.52½	.75
Mark C*	lb.	.88	.90
E*	lb.	.72	.75
M*	lb.	.68	.70
PL*	lb.	.63	.65
TT*	lb.	.72	.75
WS*	lb.	.98	1.00
X*	lb.	2.50	2.75
XI*	lb.	.87	.90
XV*	lb.	.88	.90
XX*	lb.	.58	.60
Metasap 613-A*	lb.	—	.69
613-B*	lb.	—	.84
613-C*	lb.	—	1.06
621*	lb.	—	.88
624*	lb.	—	.75
633*	lb.	—	.75
635*	lb.	—	.45
Modicol N*	lb.	.41½	.42½
S*	lb.	.30⅓	.31⅓
Sodium Silicates 41°/1:32	cwt.	1.00	2.10
Stabelan E*	lb.	1.35	1.50
XL*	lb.	.55	.65
HR-50*	lb.	.75	.90
HR Liquid*	lb.	.65	.75
HR Paste*	lb.	.85	.95
HR Powder*	lb.	.95	1.05
No. 110 Liquid	lb.	.65	.75
No. 115 Liquid	lb.	.85	.95
No. 120 Liquid	lb.	.65	.75
Stabilizer No. 52*	lb.	1.90	2.00
89X*	lb.	.75	.80
B-5*	lb.	—	.70
E6B*	lb.	—	.95
G-1*	lb.	1.25	1.40
HR*	lb.	.85	.89
L*	lb.	—	.60
OM-10*	lb.	—	1.95
Staflex OY*	lb.	1.00	1.20
QXMA*	lb.	—	.70
Stayrite 10*	lb.	.34	.36
P-10*	lb.	.41	.43
15*	lb.	.53	.58
20*	lb.	.37	.42
22*	lb.	1.00	1.13
25*	lb.	.35	.40
70*	lb.	.68	.70
71*	lb.	.88	.90
73*	lb.	.59	.62
76*	lb.	.53	.55
80*	lb.	.68	.70
90*	lb.	.68	.70
95*	lb.	.68	.70
229*	lb.	.45	.50
Vanstay C-73*	lb.	.63	.65
HT*	lb.	.87	.90
L*	lb.	.32	.35
N*	lb.	.98	1.00
R*	lb.	.67	.70
S*	lb.	.57	.60
Z*	lb.	.62	.65

STIFFENING AGENTS

Polyac*	lb.	—	1.80
Processing Stiffener 710*	lb.	—	.88
Solvitose HDF, H. C-S, T. and F*	lb.	.22	.25
Versatil Gum 8-E*	lb.	.15	.19

SUN CHECKING AGENTS

Allied AA-1144*	lb.	.23	.24
AA-1177*	lb.	.15½	.16½
Antisol*	lb.	—	.23
Antisun* (Chipped)	lb.	.15½	.17½
(Slabbed)	lb.	.15	.17
Heliozone*	lb.	.31	.32
Microflake*	lb.	.20	.24
Nacconol NRSF*	lb.	.40½	.45
NBC*	lb.	—	1.55
Ross Sunproofing Waxes*	lb.	—	.14½
Sunolite*	lb.	.16	.22
127*	lb.	.16½	.20½
154*	lb.	.23	.25
Sunproof*	lb.	.31	.32
713*	lb.	.25	.26
Improved*	lb.	.25	.26
Super*	lb.	.40	.41
Jr.*	lb.	.20	.21
Tonox*	lb.	.52	.54

SURFACE ACTIVE AGENTS

Anhydrapent*	lb.	.56	.59
Anhydrol 6990*	lb.	.51	.56
6991*	lb.	.51	.56
Aquarex D*	lb.	—	.78
G*	lb.	—	.21
MDL*	lb.	—	.33
ME*	lb.	—	.80
NS*	lb.	—	.60
SMO*	lb.	—	.50
WAQ*	lb.	—	.22
Emulphor EL-620*	lb.	—	.40
EL-719*	lb.	—	.58
ON-870*	lb.	—	.55
Igepal CA-630	lb.	—	.29
CO-630	lb.	—	.29
CO-730	lb.	—	.29
CO-850*	lb.	—	.29
CO-880*	lb.	—	.29
Igepon CN-42*	lb.	—	.25
T-33*	lb.	—	.21
T-51*	lb.	—	.13½
T-77*	lb.	—	.49
Kessco 50201*	lb.	—	.43½
50203*	lb.	—	.46
18201*	lb.	—	.36½
18203*	lb.	—	.36
Pluronic L62*	lb.	.33½	.39
L64*	lb.	.33½	.39
Sellogen Gel*	lb.	—	.12¾
Soybean Lecithin	lb.	.13	.17

TACKIFIERS

Amalgamator Z-4*	lb.	.32	.33
Arcco 620-32B*	lb.	.20½	.21½
716-30*	lb.	.18½	.19½
1041-21*	lb.	.16½	.17½
A-26*	lb.	.18	.19
Bunaweld Polymer No. 780*	lb.	—	.24
No. 5514*	lb.	—	.35
Galex* (dms.)	lb.	.17¾	.18¾
Indopol H-300*	gal.	1.00	1.22
Koresin*	lb.	—	.95
Liquid Rubber Flux*	lb.	—	.14
Nacconal NRSF* (dlvd.)	lb.	.40½	.45
Nilox Resin* (c.l.)	cwt.	—	14.50
Resin V	lb.	—	.23½
Synthol*	lb.	.17	.24¾
Vistac A*	lb.	.21½	.22¼
Vistanex LM Grades*	lb.	—	.45
Zirex* (c.l.)	cwt.	—	14.75

THICKENERS (For Latex)

Alcogum AN-6*	lb.	—	.05
AN-10*	lb.	—	.08½
PA-10*	lb.	—	.12
Betanol* (dms.)	lb.	.70	.95
Gomme Labolene*	lb.	.45	.47
Good-rite K-702*	lb.	.34½	.35
K-704*	lb.	.21	.22
K-705*	lb.	.31	.32
K-707*	lb.	.18	.19
K-708*	lb.	.29	.30
K-710*	lb.	.15	.16
Modicol VD*	lb.	.13⅓	.14⅓
VE*	lb.	.13⅓	.14⅓
Polyco 296 BT*	lb.	.15	.16
296-N*	lb.	.15	.16
530*	lb.	.15	.16
Propylene Laurate (dms.)	lb.	.57	.82
Sodium Silicate, 41°/1:3.2	cwt.	1.10	2.20
Solvitose Series*	lb.	.22	.25

VULCANIZING AGENTS

Selenium

Vandex*	lb.	—	7.50

Sulfur

Aero Brand* (c.l.)	cwt.	—	2.65
Blackbird* (c.l.)	cwt.	—	2.85
Cloud* (c.l.)	cwt.	—	2.80
Crystex*	lb.	.19½	.23
Darex Dispersed Sulfur*	lb.	.14	.16
Devil A* (c.l.)	cwt.	—	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60*	lb.	.12½	.13
Ko-Blend IS*	lb.	—	.39
Mist* (Wettable) (c.l.)	cwt.	—	4.00
Spider* (c.l.)	cwt.	—	2.80
Star* (c.l.)	cwt.	—	3.25
Sulfasan R*	lb.	1.55	1.57
Tire* (c.l.)	cwt.	—	2.40
Tube* (c.l.)	cwt.	—	3.25
Vultac 2*	lb.	.47	.49
3*	lb.	.51	.53

Tellurium

Tellloy*	lb.	—	2.75

WETTING AGENTS

Advawet No. 10*	lb.	—	.17
No. 33*	lb.	—	.48
Aerosol 18*	lb.	—	.40
AY*	lb.	1.00	1.20
MA 80%*	lb.	.67	.72
OS*	lb.	.39	.45
OT 75% Aqueous*	lb.	.63	.68
OT 100%*	lb.	1.00	1.20
OT-B*	lb.	.85	1.05
Alrosal* (dms.)	lb.	—	.40
Alrosperse*	lb.	—	.18
Anhydrol 6990* and 6991*	lb.	.51	.56

WETTING AGENTS (Cont'd)

Areskap 50*	lb.	.30	.32
Dry 100*	lb.	.60	.64
Aresket Dry 300*	lb.	.60	.64
Aresklene 375*	lb.	.42	.47
Armacs*	lb.	.28	.77
Arquads*	lb.	.42	.61
Emcol 5100* (dms.)	lb.	—	.31
Energetic W-100	lb.	.28½	.35
Etho-Chemicals*	lb.	.26	.58
Ethomeen S/15*	lb.	.48	.50
T/15*	lb.	.46	.48
Kesco E-122* (dms)	lb.	—	.45
18201*	lb.	—	.38½
Kreelon 4D* (dms.)	lb.	.13	.16
8G* (dms.)	lb.	.26	.28
Kyro EO* (dms.)	lb.	—	.29¾
Modicol N*	lb.	.41½	.42½
S*	lb.	.30⅜	.31⅜
Nacconol SL* (dlvd.)	lb.	.084	.10
60S* (dlvd.)	lb.	.19	.225
Nacconol A* (dlvd.)	lb.	—	.52
Nekal WS-25	lb.	—	.38
WS-99	lb.	—	.95
Orvus AB Granules*	lb.	.15¾	.16¾
Parnol*	lb.	.13	.18
Regal Beads	lb.	.12¾	.16¾
H. D. Beads	lb.	.12¾	.15¾
Santomerse No. 3	lb.	.41	.45
S*	lb.	1.55	1.85
Selapon Gel*	lb.	—	.13
Sorapon SF-73*	lb.	—	.18
SF-78*	lb.	—	.30
Sorbit P*	lb.	—	.28
Soybean Lecithin	lb.	.13	.17
Stablex G*	lb.	.50	.90
Tergitol 4* (dms., dlvd.)	lb.	.32	.33
7* (dms., dlvd.)	lb.	.43	.44
O8* (dms., dlvd.)	lb.	.31	.32
P28* (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	—	.15
Vultamol*	lb.	—	.17½
Wetsit Conc.*	lb.	.25	.28

MISCELLANEOUS CHEMICALS

Aquesperse 30*	lb.	—	.11
Arccopel W-18*	lb.	.17	.19
Asbury Graphite*	lb.	.05	1.45
Copper Inhibitor X-872-L*	lb.	—	2.01
D-Tac*	lb.	—	.22
2-Ethyl Hexanol	lb.	.23¼	.24¼
Fura-Tone Resin 1226*	lb.	.41	.43
MODX*	lb.	.32½	.34½
Nacconates* (dms.)	lb.	.99	3.53
Para Resins*	lb.	.04	.04½
Pigmented Filmite* (dlvd.)	lb.	.16¾	—
Resorcin, Tech.	lb.	.77½	.81½
Rio Resin*	lb.	.70	.72
Rongalite CX*	lb.	—	.21½
Sherosopes*	lb.	.13½	.18¾
Sublac Resin PX-5*	lb.	.23½	.24½
Synpep*	lb.	.54	.60
Thiokol LP-2*	lb.	—	.96
LP-3, LP-32, LP-33*	lb.	—	.96
LP-8*	lb.	1.25	1.35
Tysonite*	lb.	.26	.26¾
VA-7*	lb.	—	.50
Vanfre*	gal.	2.45	3.00
No. 3* & No. 4*	gal.	1.95	2.00

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Forward full Information

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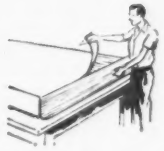

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YOUNG MAN, Ohioan, 7 years experience, overseas, calender plant installation and operation, PVC and rubber, large and small plants, extrusion, power house, etc. Unlimited possibilities, desires stateside or overseas change. Address Box 103-P, RUBBER AGE.

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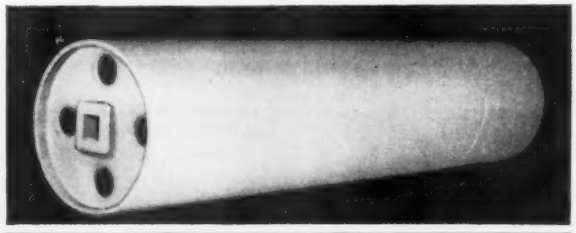

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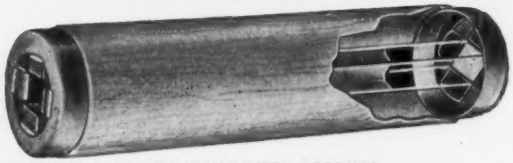

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"Equipment for Sale" continued on next page

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60 Ton, Baldwin-Southwark, 7" Ram x 18" Stroke, 26" x 26" Platen
60 Ton, 2 Rod Construction 9" Upmoving Ram x 24" Str. 35 L-R 30" F-B
75 Ton, Farquhar, Up-Acting 30" x 42" Platens
75 Ton French Oil Mill 8" ram x 8" stroke, 18" R-L x 17" F-B. Both up & down moving
95 Ton French Oil Mill, 9" Ram x 12" Stroke, 29" R-L x 18" F-B, 3" Pull Backs
100 Ton, Watson-Stillman, Bed 22" x 20", DLO 24", Self-Cont.
150 Ton, HPM, 22" x 18" Platen, 12" Ram x 24" Str., 60" DLO
150 Ton, Carey, Platens 20" x 16" Adj., DLO 8"-28"
175 Ton, Viceroy, Slab-Side, 24" x 24" Elec. Htd. Platen with Hand Pump
200 Ton, HPM, 22" x 18" Platen, 16" Ram x 36" Str., 60" DLO
200 Ton, Hymac, 16" Down Moving Ram, 30" x 30" Bed.
225 Ton, Farrel, 14" Ram x 18" Stroke L-R 26½" x F-B 24½", 7½ HP
300 Ton Dunning & Boschert 30" x 30" Platen
314 Tons, Lake Erie, 36" x 36" Semi-Automatic, Push Button Controls, 10 HP Pump & Motor
325 Ton Baldwin-Southwark, 17" Ram x 16" Stroke, 30" x 30" Platen area with Pullbacks
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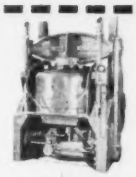
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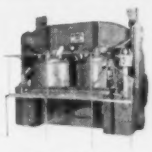
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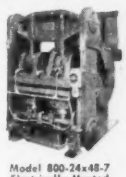
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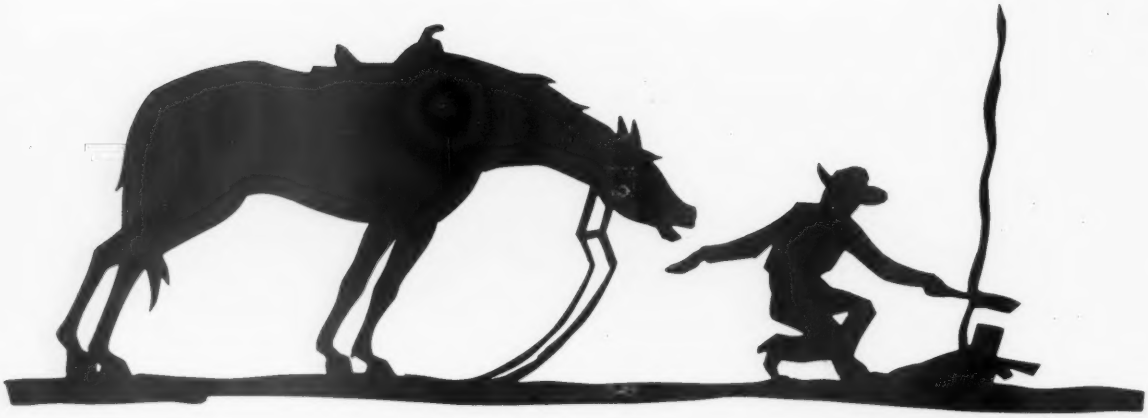

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